Annex D: Departmental Returns
This Annex explains the data that was requested from departments and their Arm's Length Bodies (ALBs).
The review team wrote to all government departments asking for information on their business critical models. This data formed the basis of the descriptive analysis in Chapter 3 of this report.
Part of the remit of the review was to "identify the business critical models identified across government and map the quality assurance mechanisms that apply to those models" and this map is published below.
The table provides the name, description and QA summary of the business critical models for each department and their arm's length bodies. The review does not include information for organisations that sit independently of government including the Office for National Statistics and the economic regulators.

The review requested data from departments to build a picture of current business critical models and their QA. The team also met with individual departments to further understand the way quality assurance is conducted. The team then summarised this data to provide a snapshot of the different types of QA in use across government.
Two key caveats are important to bear in mind when considering the data:
·   these statistics represent **a snapshot** of business critical models and QA status. They capture a point in time, late 2012, not including models in development and models that have been used in the past and that are not currently expected to be used again; and
·   this analysis is necessarily descriptive, and **should not be used to form judgements**. As discussed already, the review would expect there to be a wide range in the approach to QA across models. To be effective, and represent value-for-money, QA needs to be proportionate to the significance of the decision, the complexity
of the model (including key inputs and assumptions) and the degree of risk and uncertainty.

Dept	Model name and type	Description	Why model is Business Critical	Summary of QA	Developer Testing	Internal Peer Review	External Peer Review	Use of Version Control	Internal Audit	Quality Assurance Guidelines	External Audit	Governance	Transparency (published results)	Periodic Review
BIS	Higher Education - Student finance expenditure model. Spreadsheet based model developed in house. [Policy Simulation]	This model forecasts expenditure on maintenance grants, maintenance loans and fee loans, and is important in managing the budget and informing policy.	Reputational and financial risk given high-profile policy area and large public budgets.	All major changes to the model are documented in regular technical group papers and checked by the modelling team leader. The technical group also reviews all changes to data assumptions and methodology.\n\nKey modelling assumptions were published via the June 2011 Impact Assessment.\n\nComparisons between the model outputs and independent forecasts of expenditure are made to ensure the quality of forecasts, and key assumptions and outputs are shared with analysts in other organisations.	•	•	•	•	•			•	•	•
BIS	Higher Education - Student Number Projections model. Spreadsheet based developed in-house. [Policy Simulation]	This model provides projections of Higher Education Student numbers and outputs feed into student expenditure forecasts.	Reputational and financial risk given high-profile policy area and large public budgets.	All major changes to the model are documented in regular technical group papers and checked by the modelling team leader. The technical group also reviews all changes to data assumptions and methodology.\n\nKey modelling assumptions were published via the June 2011 Impact Assessment.	•	•	•	•	•			•	•	•
BIS	Higher Education - Income Contingent Loan Repayment Model. Spreadsheet based micro-simulation model. The earnings model was developed by Delloite, however the annual update and general upkeep is done in-house. [Policy Simulation]	This model is used to estimate the value of the existing Income Contingent Loan book.	Reputational and financial risk given high-profile policy area and large public budgets.	All major changes to the model are documented in regular technical group papers and checked by the modelling team leader. The technical group also reviews all changes to data assumptions and methodology.\n\nKey modelling assumptions were published via the June 2011 Impact Assessment.\n\nComparisons between the model outputs and independent forecasts of expenditure are made to ensure the quality of forecasts and key assumptions, and outputs are shared with analysts in other organisations. In addition, a simplified version of the loan repayment model was published on the BIS website in September 2012 to allow external researchers to examine the core modelling assumptions and methodology.\n\nAs part of the annual audit of the accounts, the NAO carry out an audit of the assumptions and changes in the loan repayment model.	•	•	•	•	•		•		•	•
BIS	Higher Education - Mortgage Style Loan Repayment Model. Spreadsheet based model developed in-house. [Financial Evaluation]	This model is used to estimate the value of the legacy mortgage style loan book and assess the value for money of its potential sale.	Reputational and financial risk given planned sale of the book and use of the model for VfM judgements.	All major changes to the model are documented in regular technical group papers and checked by the modelling team leader.\n\nAs part of the annual audit of the accounts, the NAO carry out an audit of the assumptions and changes in the loan repayment model.\n\nAll key decisions arising from the use of the model are made at the Higher Education Funding Board led by the policy director and including representatives from analysis, policy, group finance, central finance, audit and the Student Loans Company.	•	•	•	•	•		•			•
BIS	Suite of models that allocate recurrent funding for Teaching, Research and Widening Participation and capital funds. SAS code - developed in-house. [Allocation]	The models are used to allocate and monitor HEFCE recurrent and capital grants for Teaching and Research.	Fulfils one of HEFCE's primary functions - the allocation of public funds to eligible institutions.	To ensure accuracy, model outcomes are tested by using checksums and by comparing results with budget totals and previous allocations. Independent double coding is also frequently deployed. Models and processes are also subject to periodic internal and external audits.\n\nThe funding process is completely transparent. All relevant Board papers and policy decisions are publicly available and HEFCE publishes detailed technical guidance on how these are implemented. All outcomes as well as the input data used to derive the allocations are published on the HEFCE website.	•	•		•	•	•	•	•		•
BIS	Further Education Loans Repayment model Spreadsheet - simulation model in-house. [Policy Simulation]	This model is used to estimate the value of the Further Education Income Contingent Loans.	The large amount of money lent, and because Advanced Learning loans is a flagship policy.	The developer carried out a range of tests to ensure the accuracy of the model outputs, and the model was checked by another analyst. The outputs were reviewed against DWP's pension forecasting model.\n\nThe model was reviewed again by policy and analysts in 2012. The model was found to be accurate, but the reviewers decided to commission a new model to meet the additional requirements arising when FE loans become implemented (see below).\n\nThe outputs are in the public domain and published in the impact assessment.	•	•	•	•				•	•	•
BIS	Development of new Further Education loans Repayment model. [Policy Simulation]	This model is currently under development following the review of the previous model in 2012 and will be used to estimate the cost of the Further Education Income Contingent Loans.	The large amount of money lent, and because Advanced Learning loans is a flagship policy.	The specification and scope of the model has been agreed between various stakeholders at the joint operation group. The model will be quality assured by senior analyst and analysts elsewhere within the department. The outputs will also be compared with previous model and comparisons with the Higher Education model.\n\nEvidence and documentation of assumptions as the model is developed will be agreed with analysts and policy colleagues. When the model is completed it will form a part of ongoing Governance for Further Education finance and be reviewed and updated on an annual basis.	•	•		•				•	•	•
BIS	Employer Ownership Pilot Appraisal Model. [Allocation]	To appraise applications to the Employer Ownership Pilot Fund. To provide advice to the Investment Board on the monetised benefit score of each application. These are the value for money aspects of the project which can be monetised.	Outputs influence spending decisions. The pilot fund is a high profile and competitive fund	The appraisal approach was signed off by the Employer Ownership project board, and was also shared with a broader stakeholder group for comments.\n\nAll modelling assumptions have been documented and agreed with policy colleagues before development and limitations of the model have been explained to users and appraisers to ensure the results can be correctly interpreted.\n\nThe model supporting Round 2 of the pilot is being internally peer reviewed and the functionality and coding is being quality assured by the BIS central analysis team. Dummy applications and round 1 applications are used to test the model.\n\nThe Investment Board which makes the final investment decisions is made aware of any limitations of value for money assessments generated by the model.	•	•		•	•	•				•

Dept	Model name and type	Description	Why model is Business Critical	Summary of QA	Developer Testing	Internal Peer Review	External Peer Review	Use of Version Control	Internal Audit	Quality Assurance Guidelines	External Audit	Governance	Transparency (published results)	Periodic Review
BIS	Adult skills and 16-18 Apprenticeships provision model. [Forecasting]	The model is used to assess the projected future total costs and volumes of delivery of these provision areas.	The risks are wide ranging due to the inclusion of the headline figures in a Government publication and effectively establishing a fixed point for expected delivery for a given budget.	A range of tests are carried out by developer to ensure the accuracy of the model outputs, including comparing the outputs of the model with the actual funding calculation from previous years. The model's accuracy and capability is reviewed by a senior analyst regularly throughout the life of the model. The output of the model is tested regularly when the outputs are discussed with colleagues in the Skills Funding Agency. Analysts in BIS also have sight of the model and can provide some challenge. The model has also been subject to review by the Skills Funding Agency's Internal Audit team.	●	●	●	●	●	●	●	●	●	●
BIS	24+ Adult Learning Loans provision model. [Forecasting]	The model is used to assess the projected future total costs and volumes of delivery of this provision area.	The risks are wide ranging due to the inclusion of the headline figures in a Government publication and effectively establishing a fixed point for expected delivery for a given budget.	A range of tests are used to ensure quality including the review of outliers. The model's accuracy and capability is reviewed by a senior analyst regularly throughout the life of the model. The output of the model is tested regularly when the outputs are discussed with colleagues in the Skills Funding Agency. Analysts in BIS also have sight of the model and can provide some challenge. The model has also been subject to review by the Skills Funding Agency's internal audit team.	●	●	●	●	●	●	●	●	●	●
BIS	2013/14 Funding Simplification model. [Policy Simulation]	The model is used to generate outputs that assess the impact of various new concepts within a simplified funding methodology.	The risks are that inaccurate results will deliver inaccurate decisions and the resulting method could have a greater impact (adversely) on providers more than is anticipated or they can withstand. There could be adverse incentives delivered by the final version if these have not been demonstrated within the model output. There are headline political impacts if the resulting methodology doesn't deliver against the Government's commitment to simplification. This is a very sensitive area for providers.	A range of tests are used to ensure quality including the review of outliers. The model's accuracy and capability is reviewed by a senior analyst regularly throughout the life of the model. The results of this model are reviewed by an internal project team and also an external consultative group. This provides assurance that the model is working accurately and appropriately and delivering a sensible output. The model calculation and assumptions are also utilised by an external contractor to build a publicly available product that colleges and providers can use to calculate the cost of their existing provision based on an emerging methodology. The model has also been subject to review by the Skills Funding Agency's internal audit team.	●	●	●	●	●	●	●	●	●	●
BIS	Adult Skills and 16-18 Apprenticeship Allocation Calculations. [Allocation]	The model is used to calculate the distribution of the Adult Skills Budget and 16-18 Apprenticeship Budget to circa 1,000 providers.	Value of funding distributed through the calculation. Risks are reputational. If Allocations are issued incorrectly to providers the Agency's reputation for managing the Further Education sector would be impacted.	Model calculations are coded by a senior analyst and Peer Reviewed by the team / line manager against agreed standards to ensure quality. To ensure its accuracy, input data is sourced from appropriate master data source (e.g. contract performance data sourced from contract system). Sampled checks are undertaken prior to internal release. The methodology used is approved by a Governance group and Sector Representative body prior to sign off by the Executive Management Team. Allocations are reviewed and approved by the Finance team and model outputs are distributed to providers. Outputs are subsequently published. Internal Audit reviewed process in February 2012, giving an amber green risk rating. Recommendations from report are being implemented for 2013/14.	●	●	●	●	●	●	●	●	●	●
BIS	Capital Grants Investment Appraisal. [Allocation]	The model contributes to decisions on allocation of capital grants by providing a net present value figure for the project's expected cash flows.	Contributes to decisions on allocation of capital grants. Reputational risk if the model was flawed and incorrect decisions on bids were taken as a result (NOTE: that this is only one contributing aspect of the bid process.)	The model is a well established model which has been developed, tested and peer reviewed by experienced internal staff over many years. The spreadsheet itself is downloaded by colleges in order for them to make an application and so fully transparent.	●	●	●	●				●	●	●
BIS	Regional Growth Fund Appraisal Toolkit. [Allocation]	The model automated and standardised the Green Book compliant appraisal of bids to Round 3 of the Regional Growth Fund (RGF). The model was developed by an analyst in the RGF Secretariat, building on his and others' experiences from previous rounds and using the Green Book as a reference point.	Informs Independent Advisory Panel recommendations and Ministerial Group decisions. Previous rounds had been subject to a NAO report and PAC hearing. Model automated and standardised the appraisal of bids to RGF.	The model was tested by other members of the RGF Secretariat appraisal team using both dummy data and data from round 3 applications before appraisals began in earnest. The model was also peer reviewed by the central modelling team in BIS. They also carried out an extensive review of the model's functionality to ensure human/calculation error was minimised.	●	●	●	●	●	●	●	●	●	●
BIS	Advanced Manufacturing Supply Chain Initiative (AMSCI). Spreadsheet model. [Allocation]	The aim of the scheme is to improve capability and competitiveness in the UK supply chain by providing UK firms with funding to invest in capital equipment, skills and R&D. This model estimates the economic value from grants and loans offered through the Advanced Manufacturing Supply Chain Initiative (AMSCI).	Model is business critical. BIS value for money appraisal is considered together with the Project appraisal (Technology Strategy Board) and Finance Appraisal (Finance Birmingham) and is used to inform the Assessment Panel and Independent Investment Board decisions regarding which firms should receive AMSCI funding. AMSCI is currently a high profile policy.	The model is critically reviewed by the Regional Growth Team to ensure the methodologies are consistent and best practice is adopted. The model is also shared with the BIS central analytical team to ensure it is fit for purpose. At the end of process, the head of the appraisal team carries out a final check to ensure spreadsheets have been completed properly and that formulae and numbers are correct.	●	●	●	●						●
BIS	Energy Intensive Industries Compensation Model. Spreadsheet model developed in-house. [Forecasting]	This model is used by BIS and DECC to forecast compensation spend over the spending review period with a simple calculation detailed by the European Commission.	High profile policy and financial risk.	The model is very simple and quality assurance processes reflect this. Parallel calculation of material calculations is used to ensure accuracy and test the model. The model is also shared with DECC who provide a challenge function to the methodology used.	●	●	●	●						●
BIS	Aircraft delivery forecast. [Forecasting]	This model forecasts civil aircraft deliveries for use in the assessment of Repayable Launch Investment applications.	Forecast used in market assessments related to repayable launch investment applications.	Quality is assured by extensive logic checks and tests of model reaction to changes in inputs when constructing new versions of the model. The assumptions are agreed with the internal customer, who is a sector expert. In addition, previous forecast results are compared with actual outturn to ensure continuing fitness for purpose. The model is not published for reasons of commercial confidentiality, but the results are benchmarked annually against other industry forecasts (public and private) and the model is reviewed annually by the NAO. New RLI investments have to be approved by the Department's IDAB board which acts as an auditor of the model outputs by providing a challenge function.	●	●	●	●	●	●	●			●
BIS	Unified Model. [Science-Based]	The Unified Model output underpins all of the Met Office's Weather and Climate Prediction capabilities, including ocean and sea ice modelling.	Model contributes to the underpinning capability which is required for the Public Weather Service, DECC and DEFRA contracts. Political, reputational and financial associated risks are great, but difficult to quantify.	A wide range of developer testing is used within Met Office, in UK universities and internationally from Unified Model partners. Both the model code and science are reviewed internally and externally and the science included in the Unified Model is published in peer reviewed papers in the open literature. The Unified Model is fully documented on the Met Office website.	●	●	●	●				●	●	●

Dept	Model name and type	Description	Why model is Business Critical	Summary of QA	Developer Testing	Internal Peer Review	External Peer Review	Use of Version Control	Internal Audit	Quality Assurance Guidelines	External Audit	Governance	Transparency (published results)	Periodic Review
BIS	NAME (Numerical Atmospheric-dispersion Modelling Environment.) [Science-Based]	NAME models atmospheric dispersion of particles e.g. ash, radiation, airborne disease etc.	Model contributes to the underpinning capability which is required for the Public Weather Service contract. Again political, reputational and financial associated risks are great, but difficult to quantify.	Confidence in the model has been established over time based upon subjective comparison of predicted spread of material and observations. Code changes are discussed by the person making the change and their line manager and with others if deemed necessary. Code development is regularly discussed and coordinated at internal NAME Technical Meetings and code changes are reviewed as necessary when new versions of the code are released. Model results are published and scrutinised in peer reviewed papers in the open literature. NAME is described on the Met Office website and many results and aspects of the science are published in the public domain through peer reviewed scientific papers. The code of NAME is available to a number of external bodies with whom the Met Office collaborate.	•	•	•	•				•	•	•
CCC	Cost-benefit model residential buildings [Policy Simulation]	Calculates the present value of the costs and benefits of adaptation options for addressing climate risks to the residential buildings sector.	Evidence supporting the Committee's advice to Government on the type and scale of adaptation action required to address current and future climate risks.	Developer testing, internal and external peer review, transparency.	•	•	•	•				•	•	N/A
CCC	Cost-benefit model flooding [Policy Simulation]	Calculates the present value of the costs and benefits of investment in property-level flood measures (resistance and resilience).	Evidence supporting the Committee's advice to Government on the type and scale of adaptation action required to address current and future climate risks.	Developer testing, internal and external peer review, transparency.	•	•	•	•				•	•	N/A
CCC	Flood defence, in-house [Policy Simulation]	The model compares future flood defence spending profiles with published long-term investment scenarios by the Environment Agency.	Formed the basis for our key messages for our Third Progress Report. These were quite high profile - picked up in the press.	In-house testing by developer and colleagues, external peer review, results assessed by stakeholders.	•	•	•	•				•	•	N/A
CCC	PLEXOS for Power Systems model (most recently run for CCC by Redpoint Energy alongside Redpoint Investment Decision Model) [Forecasting]	Models despatch and investment in UK power sector. Produces scenarios for electricity capacity, generation, emissions, costs, prices, etc on an annual basis, reflecting hourly despatch requirements.	A key part of the evidence base informing Committee advice on achievable and desirable emissions reductions for UK power sector to 2030, and informing trajectories against which progress is monitored.	Developer testing, internal and external peer review, transparency.	•	•	•	•		•		•	•	•
CCC	Zephyr power despatch model (run by Poyry Management Consulting) [Forecasting]	Models despatch and investment in UK power sector. Produces scenarios for electricity capacity, generation, emissions, costs, prices, etc on an annual basis, reflecting hourly despatch requirements.	A key part of the evidence base informing Committee advice on achievable and desirable emissions reductions for UK power sector to 2030, and informing trajectories against which progress is monitored.	Developer testing, internal and external peer review, transparency.	•	•	•	•		•		•	•	•
CCC	Mott MacDonald Levelised Cost of Electricity Model [Forecasting]	Models levelised cost of different electricity generating technologies based on input assumptions for capital costs, running efficiency, fuel prices, etc	A key part of the evidence base for the Committee's advice on renewable energy and more broadly for informing Committee advice on achievable and desirable emissions reductions for UK power sector to 2030, and informing trajectories against which progress is monitored.	Developer testing, internal and external peer review, transparency.	•	•	•	•		•		•	•	•
CCC	DECC Energy Model [Forecasting]	Produces projections of UK energy demand and emissions by sector, currently to 2030.	Informs CCC advice on carbon budgets.	Developer testing, internal and external peer review, transparency, benchmarking. The CCC conducts additional model QA to that conducted by the owner department.	•	•	•	•				•	•	•
CCC	MARKAL Model [Forecasting]	Produces scenarios for the energy system to 2050, that minimise system costs subject to constraints (e.g. on emissions and given projections for the level of energy service demand)	Informs CCC advice on the 2050 target, carbon budgets and the strategy for meeting these.	Developer testing, internal and external peer review, transparency, benchmarking.	•	•	•	•		•		•	•	•
CCC	MAGICC Model. Out-sourced with Met Office Hadley Centre. [Science-Based]	The model calculates global average atmospheric concentrations, surface temperature and sea level rise for a given scenario of global emissions	A key part of the evidence informing CCC advice on the UK's long-term target and the inclusion of international aviation and shipping within the carbon accounting framework.	Developer testing, has been used in several hundred peer-reviewed academic papers, is regularly employed by the Intergovernmental Panel on Climate Change (IPCC).	•	•	•	•		•		•	•	•
CCC	Review of efficiency and cost assumptions for road transport vehicles to 2050 [Forecasting]	Provides assessment of cost of using low carbon road transport vehicles to 2050. Key outputs inform contribution of road transport to longer term decarbonisation goals.	Reputation risk: Underpins estimated cost of using road transport solutions to meet carbon budgets.	Developer testing. Internal peer review. External peer review.	•	•	•	•		•		•	•	•
CCC	Cost and performance of electric vehicle batteries. [Forecasting]	Forecasts future costs of Electric Vehicle batteries. Used to inform contribution of electric vehicles to longer term decarbonisation goals.	Reputation risk: Underpins role and cost of EV deployment in carbon budgets	Developer testing. Internal audit. External peer review.	•	•	•	•		•		•	•	•
CCC	DfT National Transport Model [Forecasting]	The NTM projects travel demand and emissions, by mode and region, given assumptions about population, income, fuel costs etc. CCC uses projections of vehicle-km from the NTM to underpin its scenarios for road transport demand and emissions.	Could engender reputational damages.	The NTM is a DfT model - please refer to DfT for information on their QA process in terms of developer testing etc. The CCC has conducted some additional model QA to that conducted by the owner department. CCC also reviews output from the NTM, and the underpinning assumptions, prior to use.		•		•				•	•	•
CCC	NERA low-carbon heat model [Forecasting]	Projects the costs and uptake of low-carbon heat technologies in households and industry to 2030.	Evidence underpinning 4th carbon budget recommendation.	Developer testing, internal peer review, external peer review, internal audit, use of version control, results are in public domain.	•	•	•	•		•		•	•	N/A
CCC	Industry sector (AEA post-2020 industry model and Element Energy industry CCS model) [Forecasting]	Projects the costs and uptake of low-carbon options in energy intensive industry to 2030.	Evidence underpinning 4th carbon budget recommendation.	Developer testing, internal peer recview, external audit, use of version control, results are in public domain.	•	•	•	•		•		•	•	N/A
CCC	Residential sector abatement model [Forecasting]	Projects the costs and uptake of energy efficiency options in residential buildings to 2020.	Evidence underpinning 4th carbon budget recommendation. Reputational.	Internal audit, peer review.	•	•	•	•				•	•	•
CCC	Appropriate use of bioenergy model [Forecasting]	Least-cost energy system optimisation model. Identifies least-cost means to achieve emissions targets and the 2020 renewables target for a given set of energy service demands, maximum available bioenergy supply and bio and non-bio technology availability, build rates and characteristics (costs, efficiencies etc)	Could engender reputational damages.	Developer testing, peer review, version control, internal audit, external audit.	•	•	•	•		•	•	•	•	N/A

Dept	Model name and type	Description	Why model is Business Critical	Summary of QA	Developer Testing	Internal Peer Review	External Peer Review	Use of Version Control	Internal Audit	Quality Assurance Guidelines	External Audit	Governance	Transparency (published results)	Periodic Review
CO	Principal Civil Service Pension Scheme contribution rate model (v4.0) - policy simulation. [Policy Simulation]	The model is used to assess different combinations of employee contribution rates that deliver the additional pension contribution income required by the policy. The model is used for a short defined period each year.	Essential component of public service pensions reform and delivers savings as set out in SR2010.	The model was quality assured by an internal but separate analytical team within the Cabinet Office. This provides a good independent internal check of the model's accuracy and fitness for purpose and an assessment on whether the model could be made to function more effectively.

Because contribution rates vary by salary band it is critical for the accuracy of the model to have good data on the proportion of staff, and the paybill, within each salary band. The ONS Annual Civil Service Employment Statistics (ACSES) data provides near-population level assurance that we are modelling this accurately.   The data inputs for the model are updated annually with the most up to date ACSES data. | ● | ● | | ● | | | | | ● | ● | ● |
| CO | Counting Areas (v9.7) - In house European Elections Cost forecasting model (for England, Wales and Gibraltar). [Forecasting] | Calculates the cost of European Elections (in England and Wales).

Model outputs are used predominantly to distribute an advance to Returning Officers (75% of the cost). Note that although Returning Officers are responsible for a local authority area they are legally distinct.

It is not used to calculate the final value which returning officers receive - this is paid exclusively by invoice (if the final invoice value is lower than the 75% advance then Returning Officers return the money) | The output is used to lay a Parliamentary 'Returning Officers Funding Order', publically outlining the forecast cost of European Elections for all returning officers in England and Wales (and Gibraltar).

It is business critical because this value is used to determine the advance which is given to returning officers (75% of the total forecast value).

It does not however determine the overall payment to returning officers for running an election which is given as payment for an invoice. | The model was quality assured internally, including by senior officials, in order to ensure that all the calculations were correct. To assess the accuracy of the assumptions which were inputted, this model was also quality assured and was tested with a group of Returning Officers. It was not audited externally because all expenditures are fully accounted for when returning officers return their invoice. To ensure that the model continues to be fit for purpose Cabinet Office is again reviewing it as part of the funding review. | ● | ● | ● | ● | | | | | ● | ● | ● |
| CO | Counting Areas (v3.6) - Parliamentary Elections Cost forecasting model (for Great Britain). [Forecasting] | Calculates the cost of Parliamentary Elections (in England and Wales).

Model outputs are used predominantly to distribute an advance to Returning Officers (75% of the cost). Note that Returning Officers are each responsible for a Parliamentary constituency (which does not align to local authority areas) they are legally distinct.

It is not used to calculate the final value which returning officers receive - this is paid exclusively by invoice (if the final invoice value is lower than the 75% advance then returning officers return the money) | The output is used to lay a Parliamentary 'Returning Officers Funding Order', publically outlining the forecast cost of Parliamentary Elections for all returning officers in England and Wales.

It is business critical because this value is used to determine the advance which is given to returning officers (75% of the total forecast value).

It does not however determine the overall payment to returning officers for running an election which is given as payment for an invoice. | The model was quality assured internally, including by senior officials, in order to ensure that all the calculations were correct. To assess the accuracy of the assumptions which were inputted, this model was also quality assured and was tested with a group of Returning Officers. It was not audited externally   because all expenditures are fully accounted for when returning officers return their invoice. To ensure that the model continues to be fit for purpose Cabinet Office is again reviewing it as part of the funding review. | ● | ● | ● | ● | | | | | ● | ● | ● |
CO	Dynamic Cost Model (v3.0) - in house policy simulation model simulating the specific implication of Individual Electoral Registration [Policy Simulation]	Calculates the cost of Individual Electoral Registration	Business critical because it is necessary to accurately assess the cost of the different options for Individual Electoral Registration.	The model was reviewed internally and tested by the developer to ensure its integrity and was further tested with external reviewers so as to ensure that all assumptions accurately reflected the true costs.	●	●	●	●					●	●	N/A
DCLG	Business Rates Retention [policy simulation]	The model simulates the impact on local authority income of the Local Government Rate Retention scheme over the period 2013-14 to 2019-20.	Could have a significant financial/reputational impact on the department.	The model has been constructed and used by analysts within DCLG using historic information on business rates growth to help inform the development of the local government Business Rates Retention Scheme. Detailed developer testing undertaken on the models including checks on formulae, particularly around changes and updates to model. Reasonableness checks of the results are undertaken, with independent calculations checked for sample local authorities. Version control is embedded in the models and file naming conventions. The model has been reviewed and updated on an ongoing basis as the policy has become firmer and as new information has become available. In the early stages of policy formulation, assumptions used in the model were discussed and challenged at regular senior level meetings.	●	●		●					●		
DCLG	Council Tax Support Allocations [Allocation]	The model distributes funding for Council Tax Support, which replaces Council Tax Benefit for 2013-14 (provided by the OBR) between local authorities, using published data of authorities' previous expenditure and Council Tax levels (on a pro-rata basis).	Could have a significant financial/reputational impact on the department.	The methodology has been peer reviewed internally by staff in the Local Government Finance Directorate, and has been subject to public consultation. The consultation document was accompanied by provisional funding allocations to enable local authorities to understand the outcomes for their own areas. The methodology was confirmed following consideration of consultation responses, and revised allocations were published in December, using data published at the Autumn Statement. There has been a further opportunity for local authorities to make representations about the impact of the methodology on individual allocations through the consultation on the Local Government Finance Settlement.	●	●								●	
DCLG	Housing Guarantees [Policy Simulation]	The model is used to calculate the Government's expected losses from the proposed housing guarantee scheme.	Could have a significant financial/reputational impact on the department.	The financial flow model has been cross-validated internally by multiple analysts, including senior analysts. It has also been peer reviewed by Treasury officials, and it's underpinning assumptions have been reviewed by commercial consultants with relevant financial expertise. In addition to this, DCLG has commissioned Reading University to review the remaining, stochastic modelling, element of the analysis.	●	●	●								
DCLG	Local Government Finance Settlement [Allocation]	The model performs the calculations as set out in the Local Government Finance Report for the relevant year. From 2006-07 to 2012-13 this meant calculating Formula Grant. From 2013-14 onwards it will calculate (i) tariffs and top-ups (ii) Revenue Support Grant (iii) the safety net level.

It is supported by the outputs of a number of other models including, for example, the Council Tax Base projection model. | Has a key financial/reputational impact on the department.

Provides funding position for every local authority in England.

Subject to significant legislation and regulation.

Could compromise the operation of Local Authorities. | For annual settlements the indicator data used within the settlement is double-run. Validation of the data is then carried out and, if necessary, data suppliers are contacted to explain anomalies in the data sets. The intention is always to double run the Relative Needs Formula, and the police and adult social care formulae are matched with their relevant departments. The calculations are checked by National Audit Office auditors, and changes to the model for 2013-14 were discussed with the Baseline Sub-Group, which comprises a number of experts from local government, together with officials from other government departments. Drafts of the Local Government Finance Report for 2013-14 were quality assured by the Settlement Working Group, which includes external local government representatives. A statutory consultation takes place over the Christmas period, prior to approval by the House of Commons of the Local Government Finance Report. | ● | ● | ● | | ● | | | | ● | ● | ● |
| DCLG | Supporting People Distribution Formula [Allocation] | The model is used to give a provisional allocation for Supporting People and Housing Strategy for Vulnerable People to local authorities, which is then rolled into the Local Government Finance Settlement. | Could have a significant financial/reputational impact on the department.

Could compromise the operation of Local Authorities. | The previous SPDF model was recently revised by government statisticians, using more up to date data. This included on using population projections based on the 2011 Census and deprivation data from the Index of Multiple Deprivation 2010. Random spot checks of the model have been carried out by an analyst elsewhere in the department to ensure it is in working order. The outputs from the SPDF model are fed into the Business Rate Retention Scheme model. | ● | ● | | | | | | | | | |
| DCMS | Lottery Income Projection Model [Forecasting] | Projects income to lottery distributors resulting from National Lottery ticket sales over the next 5 years. Incorporates projections of NLDF and distributor drawdown. | Employed by DCMS to inform investment strategy for NLDF. Used by lottery distributors as a basis for own financial planning. | Used to produce regular projections of NLDF income for distributors and OBR and simulations to assist with policy development. Regular, systematic and multi-dimensional QA is required. Model development was externally peer reviewed. An annual internal audit is conducted. Accuracy of model outputs is regularly assessed by DCMS and the results are shared with users. Users are enabled to access the model. | ● | ● | | | ● | | | | ● | | ● |

Dept	Model name and type	Description	Why model is Business Critical	Summary of QA	Developer Testing	Internal Peer Review	External Peer Review	Use of Version Control	Internal Audit	Quality Assurance Guidelines	External Audit	Governance	Transparency (published results)	Periodic Review
DCMS	Mobile Infrastructure Project (MIP) VfM Model [Financial Evaluation]	The model calculates value for money of investment in MIP. This is done on the basis of behavioural relationships drawn from economic literature.	Provides BCRs which form the basis for procurement decisions by BDUK.	Assesses value for money of the Mobile Infrastructure Programme. It was judged that the expense of external peer review would be disproportionate. Model development involved internal peer review. Results are subjected to Gateway Reviews.	●	●	●						●	
DCMS	Funding Allocation Model including Superfast Broadband Cost Model [Forecasting]	Provides a postcode based analysis of existing and planned provision of basic and superfast broadband across the UK, enabling premises where there is not commercial provision to be identified for policy and European State Aid purposes. When aggregated to exchange, cabinet and Local Authority/Devolved Administration levels this enables estimates of the scope for and possible costs of a private sector operator using BT's network (e.g. a sub-loop unbundler) to provide a FTTC solution for a number of the Government's Britain's Superfast Broadband Future objectives. Ranking the estimated cost of upgrading each existing BT cabinet to enable access to SFBB services to the delivery points it serves provides an estimate of the current funding gap (based on information on commercial infrastructure roll outs) of reaching a given target percentage UK and local coverage for Superfast Broadband (SFBB).	Drove published indicative allocations to local authorities in Summer 2011 under the BDUK rural programme to deliver the best SFBB network in Europe by 2015, where errors could affect achievement of government targets and relationships between central government and local authorities/devolved administrations. Informs European State Aid negotiations and decisions both nationally and locally, where errors could make pursuit of government objectives illegal or could make suppliers unwilling to bid because of legal uncertainties related to the possibility of having to repay grants. Informs European State Aid decisions, and could delay or prevent delivery of the BDUK rural and urban programmes. Informs local decisions on areas to intervene, where errors could reduce central government credibility.	Allocation of funding to the various schemes designed to improve broadband provision in rural communities is assisted by use of this model. Rigorous and regular external and internal QA is required. The model was originally built by outside contractors and externally peer-reviewed. It is revised as new information becomes available. Results are shared with local authorities, which employ them in planning their own broadband schemes.	●	●	●	●		●		●	●	●
DECC	Updated Energy and Emissions model [Forecasting]	Produces projections of energy demand and emissions by fuel and sector under existing firm and funded policies.	Projects performance against carbon budget targets required to plan policies to meet these and respond to CCC annual reports. Electricity demand projections required to model future electricity generation requirements, security of supply, decarbonisation policies and renewables obligation. Also required as baseline for individual policy impact assessments and for prices and bills impacts.	The model is subject to developer testing for every update to demand equation methodology to ensure formulae are entered correctly. Annual updates to inputs are also quality assured by analysing changes in outputs to ensure these are as expected. A range of developer tests are undertaken on final outputs before publication. In 2012 a more extensive programme of developer testing was implemented following transfer of the demand model to a new interface. Automated checks for potential sources of error were set up and the results from the new interface were checked and reconciled with outputs from the previous software. Internal peer review of model updates is built into the annual publication cycle, and the published results are also informally peer reviewed by a panel of industry experts which meets annually. In 2012 DECC undertook a comprehensive internal review of the model overseen by a cross-departmental working group. The Committee on Climate Change commissioned a formal external peer review by Cambridge Econometrics in 2011.	●	●	●	●		●		●	●	●
DECC	2050 Calculator, Strategy Directorate. Energy and emissions scenario analysis tool. Developed and maintained in-house. Fully transparent and open to the public. [Science-based]	The 2050 Calculator is a scenario analysis tool for exploring the full range of technically feasible energy and emissions pathways to 2050. It shows the implications of different pathways for costs, air quality, land use and greenhouse gas emissions.	This model helps Government answer long term, strategic questions. It is used to explore the wide range of technically feasible pathways to 2050 and to understand the trade-offs between different technology options. It is fully open to the public and has a relatively high profile. The model's open source nature has allowed other countries to develop their own versions with DECC's help, including; China, South Korea and Wallonia, with many more in the pipeline.	An extensive schedule of stakeholder workshops was completed during the model's development phase, gathering expert opinion on aspects of the model from industry experts, academics and other Government departments. Following peer review across Government, the full model was published as a call for evidence, allowing full public scrutiny of both its results and workings, with a public wiki provided for continual feedback. Developments to the model are overseen by a working group group of analysts with relevant sector expertise across DECC, DfT, Defra and BIS. Final sign-off of all notable changes is required by four senior directors within DECC, including the Chief Scientific Advisor.	●	●	●	●		●		●	●	●
DECC	Energy Company Obligation (ECO) - Affordable Warmth Model [Policy Simulation]	Models the optimal delivery and investment decisions for suppliers obligated to meet the Energy Company Obligation Affordable Warmth target. Key outputs are: the level of the statutory Affordable Warmth target; costs of meeting the target; uptake and mix of thermal efficiency measures; changes in bills and greenhouse gas emissions.	The model is used to set the statutory Affordable Warmth target that requires obligated energy suppliers to deliver reductions in heating costs to eligible households. The target is estimated to be equivalent to £350m of annual expenditure for obligated suppliers.	This model has been subjected to quality assurance through Developer Testing; Internal Peer Review by multiple analysts within the project team; Labelled version control; clear Governance and senior sign-off; Transparency from publication of approach and model results; and Periodic Review at each stage of the policy development process (initial, consultation, consultation response, final, next stage). The model was developed before Departmental QA guidelines were established, and given the scope of the model it was not deemed necessary to undertake internal or external audits.	●	●	●	●				●	●	●
DECC	CRC Impact Assessment Model [Policy Simulation]	Calculates the costs and benefits of the current and simplified CRC Energy Efficiency Scheme; allows various scenarios to be considered including e.g. the removal of different participants from the scheme.	Model is used to appraise policy and drives decisions on options for simplifying the scheme i.e. on coverage of the Scheme or admin burdens.	The CRC model was internally peer reviewed by two different DECC analysts before the publication of impacts assessments at consultation and final stage. The model was developed before the current DECC QA guidelines were established. The National Audit Office (NAO) reviewed the CRC model for the briefing they prepared for the Energy and Climate Change Committee (published at http://www.nao.org.uk/publications/1213/crc_energy_efficiency_scheme.aspx in March 2012) . The model was updated prior to the publication of the final Impact Assessment in December 2012 taking on board the NAO comments.	●	●	●	●			●	●	●	
DECC	Smart Meter Cost Benefit Model [Policy Simulation]	Economic appraisal of the roll-out of smart meters. The model calculates present value costs and benefits over the period 2012-2030 of alternative roll-out scenarios for smart meters in Great Britain.	The model has been used since 2009 to appraise policy and implementation options for the roll-out of smart meters, a coalition agreement policy and one of DECC's key policy objectives.	The Smart Meter Cost Benefit Model has been built and developed both in-house and by externally contracted professional modellers. The model has been subject to both internal and external peer review, and has developed over time to reflect changes in the evidence base and its assumptions. The outputs and key assumptions of the model have been published since 2009 in a series of Government Impact Assessments, all of them available on DECC's website. The model has been externally audited twice.	●	●	●	●			●	●	●	●
DECC	Green Deal Household Model, including Energy Company Obligation (ECO) optimiser [Policy Simulation]	Calculates predicted uptake profile of energy efficiency measures in the domestic sector under the Green Deal financing mechanism with Energy Company Obligation subsidy for eligible measures (within the ECO carbon targets). The GDHM provides the estimated level of carbon abatement at different levels of Energy supplier spend.	Produces key estimates of carbon abatement and the associated spend by energy suppliers for the Green Deal / ECO Impact Assessment. Has been used to set legally binding carbon reduction targets for obligated energy suppliers under the Energy Company Obligation. The model's outputs include inputs to department's policy impact on energy bills estimates, as well as job impacts, and energy and carbon savings estimates. Will be used in conjunction with monitoring and evaluation purposes, and possibly to inform future supplier obligation target setting.	The Green Deal Household model was initially built by an external contractor and Quality Assured (QA'd) by DECC modelling experts. It has subsequently been developed further as the policy evolved. These developments were checked during the model build and the whole model was subsequently formally QA'd twice. We have also invited external stakeholders to robustly challenge both the model's functionality and results. The model is constantly reviewed to account for the latest evidence and policy thinking. The model has therefore been subject to the following types of Quality Assurance: Developer Testing, Internal Peer Review, Version control, Governance, Transparency, and Periodic Review methodologies.	●	●		●				●	●	●

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DECC	Renewable Heat Incentive (RHI) Model [Policy Simulation]	RHI model is an Excel spreadsheet model for setting tariffs for the RHI scheme and how much renewable heat may be achieved under different scenarios and at what cost up to 2020.	The Renewable Heat Incentive was launched with the objective of helping the UK achieve the targets set out under the Renewable Energy Directive. The model was created to support policy development to support a broad range of renewable heating to encourage diversification of technologies, provide more choice to consumers and allow the renewable heat market to develop. The scheme offers support in the form of tariffs which is estimated to run into billions of pounds for the lifetime of the scheme. The model is used to calculate different tariffs and the subsequent take-up of renewable technology with these tariffs under different conditions and policy scenarios. The outputs of the modelling are key analytical inputs for policy development.	NERA, an external consultancy, was commissioned by DECC to build an economic model to set tariffs and forecast uptake in the Renewable Heat Incentive scheme. The model has been subject to NERA's own internal testing and QA as well as scrutiny by DECC. In addition, DECC commissioned a high level audit from a senior academic economist who found it fit for purpose. One of the key inputs is the cost and performance input data; AEA, an external consultancy, was commissioned to provide this and the data was reviewed internally and published for external stakeholders to comment. The model has subsequently been brought in-house and is under periodic review, including a full review and up-date of the cost and performance data by an external consultancy, Sweett. An internal audit is planned.	•	•	•	•		•	•	•	•	•
DECC	Feed In Tariff scheme (FITs) Solar PV [Policy Simulation]	The FITs solar PV model is a policy simulation model, which projects renewable electricity deployment and government support costs for small scale (i.e. less than 5MW) solar PV renewable electricity installations supported under the FITs.	This model informs Government policy underpinning its small scale renewable energy strategy and has significant budgetary implications.	The FITs solar PV model was tested and reviewed by DECC analysts, engineers and policy experts. The model has clear version control. It is regularly tested and benchmarked against latest available market information (i.e. industry opinion, pipeline analysis, deployment data, etc). While the initial version of the model was developed before the current DECC QA guidelines where introduced, the model development has followed most of the guidance's requirements in practice. The model is subject to on-going external audit.	•	•		•		•	•	•	•	•
DECC	Renewables Obligation (RO) Obligation Model [Forecasting]	The RO Obligation model is a forecasting model, which estimates the size (i.e. number of ROCs) of the Renewable Obligation over a twelve month period.	This model estimates the number of ROCs issued over a twelve month period and sets the level of Government support under the renewable Obligation for eligible technologies during that period.	The RO Obligation Model was tested and reviewed by DECC analysts, engineers and policy experts. The model has clear version control. It is tested and benchmarked on an annual basis against latest available market information (i.e. planning and pipeline analysis, deployment data, industry investment plans etc). While the initial version of the model was developed before the current DECC QA guidelines where introduced, the model development has followed most of the guidance's requirements in practice. The model is subject to on-going external audit.	•	•		•		•	•	•	•	•
DECC	Renewables Obligation (RO) Banding review [Policy Simulation]	The RO Banding review model is a policy simulation model, which projects renewable electricity deployment and government support costs for all renewable technologies eligible for support under the RO during the RO Banding review period (2013/14 to 2016/17).	This model informs Government policy underpinning its renewable energy strategy and has significant budgetary implications.	The RO Banding Review model was developed and tested by external consultants, with inputs and outputs tested and reviewed by DECC analysts, engineers and policy experts. The model has clear version control. Consultants have been using this model for a number of years to advise private clients as well as DECC. Modelling outputs were tested and benchmarked against latest available market information (i.e. planning and pipeline analysis, deployment data, industry investment plans etc). While the initial version of the model was developed before the current DECC QA guidelines where introduced, the model development has followed most of the guidance's requirements in practice. Outputs of the model are subject to on-going external audit.	•	•		•		•	•	•	•	•
DECC	Renewables Obligation Certificates (ROCs) model [Policy Simulation]	The ROCs model is a policy simulation model, which estimates the proportion of the supply curve that is deployed at given support rates for each renewable electricity technology supported under the RO.	This model informs Government policy underpinning its renewable energy strategy. It is used to benchmark other renewable energy policy modelling (i.e. RO Banding Review modelling) and simulate policy impacts under the RO.	The ROCs model was developed, tested and reviewed by DECC analysts, engineers and policy experts. The model has clear version control. Inputs and outputs are tested and benchmarked on a regular basis against latest available market information (i.e. planning and pipeline analysis, deployment data, industry investment plans etc). While the initial version of the model was developed before the current DECC QA guidelines where introduced, the model development has followed most of the guidance's requirements in practice. The model is subject to on-going external audit.	•	•		•		•	•	•	•	•
DECC	Dynamic Dispatch Model [Forecasting]	The Dynamic Dispatch Model (DDM) is DECC's model of electricity dispatch and investment. Key outputs are electricity wholesale prices, emissions, policy costs and cost benefit analysis of different scenarios. See http://www.decc.gov.uk/media/viewfile.ashx?filepath=11/about-us/economics-social-research/5425-decc-dynamic-dispatch-model-ddm.pdf&filetype=4&minwidth=true for a full description.	Key input to spending negotiations with HMT; will be key tool for decisions on Electricity Market Reform; Risk of reputational damage	The Dynamic Dispatch Model (DDM) has undergone developer testing, internal testing and external peer review (the latter by academics). Version control of the model and of all input and output files is used. The model was developed before current DECC QA guidelines were established, but is being brought into alignment with them. During planning and sign-off of the model for use, the model was overseen by a steering board of senior analysts. Results from the model are published in a range of different contexts. As the model is used regularly, the assumptions and functionality are periodically reviewed to ensure that the model remains fit for purpose. Given the level of testing and review of the model (by the contractors who built the model, external academic experts and internally), formal auditing of the model has not been carried out.	•	•	•	•		•		•	•	•
Defra	Appraisal models for flood and coastal erosion risk management investments. [Procurement & Commercial]	The generic model takes input data on flood levels, flood probabilities and floor levels of properties, and uses depth-damage relationships from research to generate probabilistic monetary estimates of flood damage for different flood management options, for specific proposed investment projects.

Models are generally constructed and operated by private sector consultants to economic appraisal principles established by Environment Agency (EA) and Defra.

Models are used to recommend substantial (up to £m) investments with long lives (up to 100 years in some cases). | Drives individual project funding decisions within Defra's largest capital investment programme. | Developer testing, models delivered by several private sector partners so subject to competition, peer review by Environment Agency, peer review by Defra, including modellers and economists (in the case of the largest investments). | • | • | • | • | • | • | | • | • | • |
| Defra | Environment Agency National Flood Risk Assessment (NaFRA) and Flood and Coastal Erosion Tool (FACET). [Planning] | The model is a high-level national version of the generic investment appraisal model described above. It takes input data on flood probabilities, extents and depths across the country and uses these in conjunction with depth-damage relationships to generate aggregate flood damage estimates to various geographies.

The model is developed and run by a private sector partner to Environment Agency specifications and with Defra oversight. NaFRA is validated and updated by local Environment Agency modelling teams.

The NaFRA / FACET model is used to forecast national and regional flood risk and damage, to inform high-level investment and resource planning decisions (for example, operation and maintenance requirements via System Asset Management Plans). | Drives key funding decisions, including Defra national analysis as part of Spending Reviews. Also helps determine level of operational resources Environment Agency Regions and Areas put in to managing specific flood management systems, affecting communities on the ground. | Developer testing, models delivered by private sector so subject to competition, peer review by Environment Agency, peer review by Defra including modellers and economists. | • | • | • | • | • | • | | • | • | • |
| Defra | Fera wildlife rabies contingency model. Policy simulation model.

ALB - The Food and Environment Research Agency (Fera). [Policy Simulation] | The model predicts which species require management, and how large an area should be included for wildlife management. The output would drive management for three to four years. | Drives substantial resource allocation in a contingency. Failure would impact on Defra reputation. | Developer testing, peer review and validation. | • | • | • | • | | • | | | • | • |
| Defra | Fera badger/cattle tuberculosis (TB) model(s). Policy simulation model.

ALB - The Food and Environment Research Agency (Fera). [Policy Simulation] | It predicts the consequences on cattle herd TB breakdown, of changes to badger and cattle management. Used to examine 'what if' scenarios for badger management in particular (e.g. badger vaccination and culling). | It supplies evidence to make policy decisions on badger management for Defra, the Welsh Assembly Government (WAG) and Department for Agriculture and Rural Development (DARD). | Developer testing, validation, version control, peer reviewed and transparent. | • | • | • | • | | • | | | • | • |

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Defra	Fera cormorant licensing model. Policy simulation model. ALB - The Food and Environment Research Agency (Fera). [Policy Simulation]	It predicts the medium term change in cormorant population size as a consequence of different licensing decisions.	Helps to define the maximum number of licenses to cull cormorants permitted each year.	External peer review and annual validation.	●	●	●	●		●		●	●	●
Defra	Fera ruddy duck eradication model. Policy simulation model. ALB - The Food and Environment Research Agency (Fera). [Policy Simulation]	Predicts the decline in the ruddy duck population, depending on the resources supplied, and predicted the time required to achieve targeted elimination of ducks.	Supports resource required from EU and Defra to achieve Defra's aim of eliminating the invasive ruddy duck.	Peer review, developer testing.	●	●	●	●		●		●	●	●
Defra	In house funding model operating jointly with Natural England to determine The Rural Development Programme for England (RDPE) budgets. [Policy Simulation]	The model converts business assumptions and policy targets into financial commitments. RDPE agreements are largely 5 or 10 year agreements. The model provides outputs of financial commitments going forwards over the longer term. Annual budgets are set and future Programme funding pressures feed into policies to develop new programme.	The model highlights pressures, can simulate different policy scenarios and give policy impacts of various funding decisions.	Internal peer review and internal audit. The model will shortly undergo an external peer review.	●	●	●	●	●	●		●	●	●
Defra	Exchange Rate Impact Calculator. [Forecasting]	The model assesses the impacts of spend, forecast spend and exchange rates on the EU budget for rural development.	Model is used for critical decisions around a EU allocation. The model outputs used for risk management in relation to Programme affordability, progress against EU spend targets and risk of surrendering EU funds.	Internal peer review and internal audit. The model will shortly undergo an external peer review.	●	●	●	●	●	●		●	●	●
Defra	Length Cohort Analysis. Science based model for Fisheries stock assessment model. In house coding. ALB - Centre for Environment, Fisheries and Aquaculture Science (Cefas). [Science-Based]	Assesses the state of the stocks of Edible Crabs and Lobsters and the strength of the fisheries acting on them. Reliable data are available from 2006 to present. The results are written into a formal stock assessment document (scientific in nature). More accessible summary reports are publically available for the first time in 2012. These are published on the Cefas website and are being presented to various forums.	Fisheries stock assessment is fundamental to understanding how fisheries are impacting the stocks and wider environment. e.g. Marine Framework Strategy Directive.	Internationally used approach. Internal peer review of code and output.	●	●		●		●		●	●	●
Defra	Nephrops assessment models. Science based model for Fisheries stock assessment model. In house coding. ALB - Centre for Environment, Fisheries and Aquaculture Science (Cefas). [Science-Based]	Assesses the state of the stocks of Nephrops. Performed annually under the control of The International Council for the Exploration of the Sea (ICES). Also models to estimate of Maximum Sustainably Yield targets, outputs updated ~ 3 years.	Nephrops fisheries fall within the Common Fisheries Policy (CFP). Monitoring and assessment of these stocks is therefore mandatory.	Model peer-reviewed through the ICES benchmark process in a multi-year cycle. Annually the model and outcomes are reviewed by expert groups within the ICES arena.	●	●	●	●		●		●	●	●
Defra	Marine finfish assessment models (models used by the International Council for the Exploration of the Sea [ICES] for providing fisheries management advice) ALB - Centre for Environment, Fisheries and Aquaculture Science (Cefas). [Science-Based]	Assesses the population status of finfish stocks, and provide catch advice. Performed annually under the control of ICES. Modelling software can usually be downloaded from the ICES website, or is publically available.	Provides a basis for fisheries management advice for finfish stocks.	Models are extensively peer-reviewed through the ICES benchmark process in a multi-year cycle. Annually the model and outcomes are reviewed by expert groups within the ICES arena and externally reviewed by NEAFC NASCO.	●	●	●			●		●	●	●
Defra	Fleet and Fishery Forecast (FCube) model for projecting catches and population sizes of fish stocks in the North Sea. (model used by ICES for providing fisheries management advice) ALB - Centre for Environment, Fisheries and Aquaculture Science (Cefas). [Science-Based]	Based on historic landing and discard estimates for 7 key fish stocks in various fisheries in the North Sea the model projects future catches based on the predicted population sizes, fishing effort and quotas. It projects the consequences for the fish stocks based on different level of catches based on various management scenarios into the short (1-2 years) and medium (3-5 years) term to advise on potential conflicts for the mixed fisheries of the North Sea. The model is generally operated within working groups of the International Council for the Exploration of the Sea (ICES) though methodology is publically available, and the model used by several marine laboratories in Europe.	The model helps inform management decisions which reduce discards in fisheries and maximises yield (and value) from fisheries.	Model was peer reviewed in international journal, there is an internal peer review within ICES before annual advice is released based on model outputs.	●	●	●	●		●		●	●	●
Defra	ICES-NE Atlantic salmon pre-fishery abundance model (model used by the International Council for the Exploration of the Sea [ICES] providing fisheries management advice) ALB - Centre for Environment, Fisheries and Aquaculture Science (Cefas). [Science-Based]	Estimates numbers of salmon from NE Atlantic countries alive at the time of the fisheries at Faroes and West Greenland. Publicly available and applied by a number of NE Atlantic countries; used on an annual basis.	Provides basis for The North Atlantic Salmon Conservation Organisation (NASCO) to set regulatory measures for Faroes and West Greenland fisheries.	Model previously subject to peer-review; application reviewed through ICES advisory process.	●	●	●	●		●		●	●	●
Defra	Scenario-based model for eel populations (SMEP) (model used by ICES for providing fisheries management advice) ALB - Centre for Environment, Fisheries and Aquaculture Science (Cefas). [Science-Based]	Models freshwater phase of eel populations as a basis for assessing stock status. Used by the Environment Agency (EA) and Cefas. Publicly available and applied every three years in line with EU reporting requirements.	Provides a basis for reporting on status of eel stocks in England and Wales under the EU Eel Regulation.	Model previously subject to peer-review; application reviewed through ICES advisory process.	●	●	●	●		●		●	●	●

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Defra	Telemac Hydro-informatics suite developed by EDF-LNEH. Finite element hydrodynamic models which couple to simulate tidal flow, wave action and sediment transport in marine coastal locations. Run in-house on high performance computing facilities. ALB - Centre for Environment, Fisheries and Aquaculture Science (Cefas). [Science-Based].	When fully coupled provides highly detailed flow fields of tides and wave action. These outputs used to derive resulting sediment transport processes and morphological change on a range covering many spatial and temporal scales.	The Telemac system provides the only practical GNU solution for a finite element model of this type. Critical in areas of coastal science and for peer reviewed submissions.	Each element of model output is validated by observations. For example - tidal elevations from NOC tide gauges, waves from Cefas WaveNet observations. Results of model studies are peer reviewed by expert panel (BEEMS) or from journal publication and conference presentations.	●	●	●	●				●	●	●
Defra	Emergency response for oil and chemical spills in waters around the UK. Cefas Spill and ASA ChemMap run in house. Use is Forecasting. ALB - Centre for Environment, Fisheries and Aquaculture Science (Cefas). [Science-Based]	Using exists databases of tidal flows and real-time wind field from UK Met Office the models predict the trajectory of oil and chemical spills. The models include Physical and Chemical processes to simulate decay and diffusion in the water column.	Very high profile (e.g. MSC Napoli, Sea Empress and Braer) and Deepwater Horizon in the Gulf of Mexico. Outputs are used by first responders (MCA and local authorities) to protect the public / environment and manage cleanup resources.	The Model is both calibrated and validated with observations of tidal height and tidal currents from a variety of locations around the UK. Peer review of models. Expert judgment is used to interpret the logistics/release rates etc to create input parameters as well as interpretation of results.	●	●	●	●				●	●	●
Defra	GETM/ERSEM General Estuarine Transport Model coupled with European Regional Seas Ecosystem Model. Fully coupled baroclinic, hydrodynamic and ecosystem model simulating key biogeochemical processes over temperate shelf seas. Includes riverine inputs. Run in-house on high performance computing facility. Use is Science Based ALB - Centre for Environment, Fisheries and Aquaculture Science (Cefas). [Science-Based]	GETM provides a baroclinic model solution of shelf sea hydrodynamics over periods of decades as a hind-cast product. It is coupled with ERSEM to simulate benthic biochemical and ecological processes.	Outputs used by many UK and International projects. E.g., MECS, OSPAR, MEMO.	Model is validated from observations and model data from a diverse range of sources. ICES, TOPEX, Cefas Endeavour, NOC, UKMO. Peer review of output is also made via publication and expert assessment.	●	●	●	●				●	●	●
Defra	Suite of Common Agricultural Policy (CAP) finance models, developed in-house. [Forecasting]	The models analyses CAP spending over the next EU budget cycle from 2014-2020, broken down by member state. It can be used to analyse various alternatives to the Commission proposals. The model is not available publicly. The EU has produced their own analysis, but has not shared their underlying modelling.	The model is an essential input to the UK position in negotiations of the next EU budget proposals and various proposals. It enables the calculation of estimates of UK and other EU member state receipts from the CAP, and thus the financial impact on Defra, UK taxpayers and farmers. Delivering the CAP is a central part of the DEFRA business plan.	Developed in-house to respond to the evolving negotiations the models have been validated by comparison to the EU Commission estimates. They have been subject to internal quality assurance. HMT officials have also analysed these proposals, and are working with Defra on using this modelling, thus providing a further cross-check on the accuracy of the models.	●	●		●				●		●
Defra	Future Options Programme (FOP) Business Case Model. For evaluation of options within an Outline Business Case (OBC). Developed within the FOP team using external consultancy resources on a 'services to assist' basis. ALB - Rural Payments Agency (RPA) [Financial Evaluation]	The model has been developed in order to support the analysis in the Economic and Financial Cases and assist the FOP OBC. It calculates the projected costs and financial benefits of a baseline scenario and five delivery options. The outputs enable the user to compare the NPV and annual costs associated with each of 5 outsourcing scenarios relative to a baseline.	The model outputs are one of the main contributing factors behind the selection of the preferred future option and the key funding decisions that this entails.	Developer testing, internal peer review, external peer review.	●	●	●	●	●			●	●	●
Defra	Waste Infrastructure Delivery Programme – PFI Modelling. (forecasting model). [Forecasting]	The model forecasts waste infrastructure capacity and compares this to waste forecasts to assess whether sufficient capacity will be in place in England to meet the 2020 EU Landfill Directive Targets.	It is critical to assess whether the EU targets will be met as failing to meet the targets could lead to infraction proceedings and fines. The PFI programme involves substantial infrastructure investment decisions.	The model is peer reviewed internally by technical experts and economists; and signed-off by Defra's Chief-Economist. The model has been externally peer reviewed by senior economic consultants for further quality assurance.	●	●	●	●				●		●
Defra	Local Authority Waste Recovery, Recycling and Disposal – LAWRRD. (forecasting model). [Forecasting]	This model is used to predict methods of local authority waste recovery, recycling and disposal. The model provides a number of outputs including estimates for England of landfill tax revenues, household recycling and local authority costs.	Model produces a number of key outputs including estimates for England of landfill tax revenues, household recycling and local authority costs.	Model constructed by external consultants and scrutinised by Defra and other government departments. The model is quality assured internally through peer review by economists and consistency checks with alternative data sources.	●	●	●	●				●		●
Defra	Methane from Landfill Model. [Science-Based]	The model estimates landfill methane emissions.	The outputs contribute to the green-house-gas emissions inventory and forms part of the monitoring of whether the UK is meeting its carbon budget targets.	Constructed by external consultants and reviewed within Defra and other government departments to quality assure the assumptions and approach used. The model is audited externally by professional auditors.	●	●	●	●			●	●	●	●
Defra	ENSIS (Natural England's protected site information system) and Site of Special Scientific Interest (SSSI) trajectory model. The core ENSIS component is a corporate Oracle database supported externally. This feeds into the SSSI Trajectory model which is a house spreadsheet. ALB - Natural England. [Science-Based]	Provides high level actions (conservation measures) required to meet statutory and policy requirements for England's legally protected sites (those underpinned by an SSSI). The derived SSSI Trajectory model provides a strategic prediction of achieving the Government's Biodiversity 2020 outcomes for SSSIs. The high level conservation measures and trajectory model are not available publically. The outcome achieved by implementation of the conservation measures is available publically via Natural England's web site. Key delivery partners for Biodiversity 2020 do have access to the detailed conservation measures and the output of the trajectory model. Key delivery partners are those with a major SSSI landholding and/or regulatory/incentive role (e.g. Defra agencies, MoD, key national VCOs, and Water Companies). This allows all key delivery partners to use ENSIS to target resources and funding. ENSIS, as a tool holding the evidence base underpinning protected site outcomes, is a 'permanent' system. The SSSI Trajectory model component is valid to 2020 – although it will continue to be refined.	Conservation measures and the trajectory work to achieve outcomes underpins: 1. Activity on European protected sites – ensuring compliance with European Habitat and Bird Directives. Continued compliance negates risk of Infraction by EU. 2. Supports Natural England's and other statutory body's legal duties for protection of SSSIs. 3. Delivery of Government's Biodiversity 2020 outcomes for SSSIs.	Developer testing by IT supplier for ENSIS; internal peer review and QA of information. Model outputs and conservation measures subject to external peer review.	●	●	●	●	●	●	●	●	●	●

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Defra	Energy using Products appraisal model, which is outsourced to consultants. [Policy Simulation]	The model itself is built in Excel and is run by consultants – it assesses energy savings and other environmental benefits, compared to the additional technology costs associated with EU minimum standards, coving an appraisal period up until 2030. Its outputs are used by Defra to inform the UK's position on the relative scope and stringency of EU mandatory minimum energy performance standards. The outputs are then also used to contribute to DECC Carbon Budget Modelling.	The total estimated UK impact of this whole raft of EU minimum energy efficiency standards, is very significant – both in terms of (i) contribution towards DECC Carbon Budgets, and (ii) household and non-domestic energy bill savings estimates.	The model undergoes regular internal QA processes by the consultants. It contains built in calculation checks - e.g. summations add up to 100% etc, and data inputs are drawn from published data from manufacturers, researchers and expert opinion. In parallel, an Independent Peer Review of the overall model is near complete. Once the outputs of the model have been estimated, further scrutiny is applied to Impact Assessments through sign-off by senior Defra economists (including additional prior internal peer review for larger scale IAs).	●	●	●	●		●		●	●	●
Defra	Compliance and enforcement risk model (in-house spreadsheet model) ALB - Marine Management Organisation (MMO). [Planning]	The model is used to identify the most significant threats to compliance with the regulations that the Marine Management Organisation is charged with enforcing, domestic and European. The model is produced to cover the whole of England (by the STCG) and then adapted for use in four regional marine areas (ATCG). Resourcing (in terms of where compliance and enforcement effort should be directed by Marine Management Organisation staff) is allocated on a monthly basis. The model is not currently used by other organisations nor is it publically available. In time some of the key assumptions that underpin the model will be made available to the public.	Drives relative priorities in terms of risk-based enforcement activities. Is essential in demonstrating compliance with 'Hampton' better regulation principles. Incorrect identification of highest risk activities could lead to serious financial, legal, reputational damages or penalties.	The model is subject to internal peer review by a range of internal enforcement practitioners, and is updated on a monthly basis with the previous month's data saved to master spreadsheet. The model is subject to review by Defra Internal Audit Division (IAD). The National Audit Office review the Defra IAD reports during each financial reporting period and review any significant weaknesses identified by IAD as part of their annual external audit. The model is reviewed by Senior Management every four months at a strategic level to consider risk and allocate resources accordingly. It is planned that the assumptions that underpin the model will be shared with the public via the MMO website when appropriate, to ensure that publication does not compromise ongoing enforcement activity or investigations.	●	●	●	●	●	●	●	●	●	●
Defra	Pay Remit model ALB - Marine Management Organisation (MMO). [Financial Evaluation]	Model calculates the Marine Management Organisation baseline pay data and models pay award options within the Treasury parameters.	Needed to calculate pay remit for formal approval from Defra Secretary of State to implement the pay award and for internal budget management against Defra funding.	Model is subject to Internal HR and Executive team clearance. The model receives formal sign off from the independent Marine Management Organisation Remuneration Committee and Trade Unions prior to pay remit submission to the Secretary of State for clearance. The model will be subject to Defra Internal Audit Division (IAD) review as part of the annual key financial controls testing. The National Audit Office review payroll including the pay remit process and approval as part of the annual external audit. The model is produced annually and takes into consideration the annual HM Treasury pay guidance.	●	●	●	●	●	●		●		●
Defra	Scenario Planning and budget model ALB - Marine Management Organisation (MMO). [Financial Evaluation]	Used to model financial allocation by team and strategic outcome at expenditure line detail for the period of the CSR in line with Sponsorship body funding envelope.	Needed to calculate CSR expenditure profile for annual budget process and CSR publication in the Corporate Plan.	Model is subject to Executive team scrutiny through the Star Chambers style challenge process and sign off by the Marine Management Organisation Board. The model and supporting financial allocation process is subject to Defra Internal Audit Division (IAD) review as part of the annual key financial controls testing. The National Audit Office review the model and full budgetary process as part of the annual external audit. The model is produced annually in line with the Spending Review allocation, Treasury budgeting guidance and Managing Public Money. Performance against budget is reviewed monthly by the Executive Team and by Defra Finance. The model is not available in the public domain however, the output of the model which is the MMO's allocation to Strategic Outcome over the Spending Review period is published in the MMO's Corporate Plan.	●	●	●	●	●	●	●	●	●	●
Defra	Badger culling maximum and minimum model (developed by government agency [redacted] but used by Natural England). ALB - Natural England. [Science-Based]	Sets the maximum and minimum number of badgers to be killed under a Protection of Badgers Act 1992 licence in accordance with the government's badger and bovine tuberculosis (TB) policy.	Model outputs are used to set the number of badgers to be killed under each 4-year licence. This is a highly sensitive area of government policy with significant reputational and legal ramifications. The implementation of the first 2 licences issued under this policy was recently delayed by 6 months because the cull numbers were higher than had been predicted.	The model is a simple spreadsheet calculation of a confidence interval based on a log normal distribution given six inputs: the mean of the distribution; the relative standard deviation of the distribution; the quantiles at which to estimate the interval (2 values); and the proportion of each quantile required (2 values). Developer testing by checking against manual calculation. External peer review by publication and opportunity to comment by an expert group.	●	●	●	●		●	●	●	●	●
Defra	Fisheries benefits from fishing at maximum sustainable yield (Centre for Environment, Fisheries and Aquaculture Science in-house spreadsheet) ALB - Centre for Environment, Fisheries and Aquaculture Science (Cefas). [Financial Evaluation]	The model is an estimation of the potential benefits that could be realised by the UK fishing industry if fish stocks are harvested using fishing effort that corresponds to maximum sustainable yield (Fmsy).	Evidence derived from the model provides an indication of benefits achievable under Marine Strategy Framework Directive and Common Fisheries Reform. It was viewed to be business critical as it helps to achieve business plan priorities.	Developer testing and sense checking of results; discussing scenarios/assumptions and results with colleagues in Defra, Marine Scotland and AFBINI; results of the analysis used in Impact Assessment signed off by Defra Chief Economist; version control.	●	●	●	●		●		●	●	●
Defra	The site selection process (decision making framework/tool) for Marine Conservation Zone (MCZ). [Science-Based]	The decision making framework provides a set of principles or criteria to help compare the qualitative benefit against quantified costs for each site. Based on the assessment, if the qualitative benefits are seen higher than the quantified costs the site will be designated. The process was informed by statutory scientific advice provided by Defra's Statutory Nature Conservation Bodies (SNCBs) that informed the benefits; and the sector costs (based on sector methodologies developed by independent regional project economists in consultation with stakeholders, Defra and SNCB economists). The sector methodologies are described separately as a part of this review. The decision making process was developed within Defra and was applied across 127 site recommendations from the regional MCZ projects.	This is essential for achievement of a business plan target.	Developer testing, internal peer review, internal audit, and transparency.	●	●	●	●	●	●			●	●
Defra	Sector methodologies and costs assessment for proposed MCZ sites. (Regional MCZ project Impact Assessment materials - http://publications.naturalengland.org.uk/publication/2071071?category=1730361) ALB - Statutory Nature Conservation Bodies (Natural England and JNCC) [Financial Evaluation]	The sector methodologies were developed by independent project economists (regional project economists) and Natural England economists in consultation with stakeholders (for example information on license application costs, frequency of application etc). Based on the methodology, spreadsheets were developed to calculate the costs to the sector for 127 sites the Statutory Nature Conservation Bodies (SNCBs) and regional projects were recommending to Defra for designation.	This is essential for achievement of a business plan target.	Developer testing, Internal peer review, External peer review, Transparency.	●	●	●	●				●	●	●

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Defra	HadGEM3-ES family of Global Climate Models. ALB - UK Met Office. [Science-Based]	The model does not allocate funding resources. Global Climate-Earth System Models simulate processes occurring in the atmosphere and at the interface between atmosphere, water and terrestrial ecosystems. Global Climate Models are used to answer questions about how climate might change in the future; depending on how the system is initiated (i.e. with what carbon dioxide concentrations in the atmosphere and what emissions we anticipate over future years). They can also be used to assess the statistical likelihood of extreme events being attributed to climate change.	These models are funded as research, eventually producing evidence to support policy decisions on adaptation planning. The previous generation of climate models helped to develop the UK Climate Projections (UKCP09) on which the first Climate Change Risk Assessment (CCRA) is based. The National Adaptation Programme seeks to identify solutions to the key risks in the CCRA and is being taken forward in conjunction with a number of government and external stakeholder, all of whom will be using information on future climate generated by global climate models (and most provided in the form of the projections, UKCP09).	Developer testing, Internal peer review, External peer review, Use of version control, Quality Assurance guidelines, Governance, Transparency, Fitness for Purpose.	•	•	•	•		•		•	•	•
Defra	Animal By-products risk based visit frequency model (approval and registration) ALB - Animal Health and Veterinary Laboratories Agency (AHVLA). [Planning]	To inform operational decisions about the Animal Health and Veterinary Laboratories Agency (AHVLA) inspection visit frequency based on key risk based parameters.	Delivery of AHVLA SLA requirements within agreed budget (risk based inspections to Animal by-products plants).	Internal validation against veterinary interpretation/expectation.	•	•	•	•		•		•		•
Defra	Animal Welfare Risk Model. ALB - Animal Health and Veterinary Laboratories Agency (AHVLA). [Planning]	Used to select claimants for welfare inspection according to risk (time since last inspection, previous compliance record with welfare legislation, cattle mortality and membership of a farm assurance scheme.	Without the model it would be impossible to accurately identify the farms to be inspected as required by the Regulations (XC and OFFC). Failure to have a risk based inspection programme might lead to disallowance.	Internal validation against criteria, external validation by Warwick University, external audit by EU Commission.	•	•	•	•		•	•	•		•
Defra	BW model using powersim - Modelling 20-year projections of condition of major waterway assets and simulating funding and charity scenarios. (forecasting and policy simulation model). ALB - British Waterways. [Forecasting]	Projections of asset condition as a key indicator of the future physical state of the waterways network under different funding and charitable income scenarios compared to not creating the charity.	Projections were a key input into the funding negotiations between Defra and the CRT in October 2011 to January 2012, and in helping to demonstrate the value of creating and long-term funding of the charity	Model runs and underlying assumptions were linked to BW's business planning process and subject to regular scrutiny by Defra during the October 2011 – January 2012 funding negotiations with additional in-depth scrutiny of assumptions by Defra and HMT before negotiations commenced. BW commissioned KPMG to review projections (subsequently published in 2012) and the mechanics of the model in October 2011 for the assurance of the incoming Charity trustees. All projections and analysis were included in the Outline (Sep-Dec 2011) and Full (April 2012) Business Cases which were scrutinised by Gateway Review teams and approved by HMT. Future scrutiny of operational and financial performance of CRT (created July 2012) will be made by its Council.	•	•	•	•		•		•		•
Defra	Seafish fishing fleet profit forecast model. ALB - The Sea Fish Industry Authority (Seafish). [Financial Evaluation]	The model has been developed by Seafish over a number of years to reflect change in the fisheries management regime (such as days at sea limits) and is a static forecast model estimating activity, earnings, costs and profits one year ahead of the baseline year.	The model compares and contrasts economic outcomes for the UK fleet based on a number of different scenarios and the analysis is part of an evidence base used in TAC impact assessments.	The model is reviewed internally each year by Seafish economists and an external consultant who assisted in model development in previous years while in-house. Model outputs are assessed by Defra economists. External peer review was undertaken in 2009 by the Danish Food and Resource Economics Institute (FOI).	•	•	•	•				•	•	•
Defra	WRAP Impact Model. ALB - WRAP. [Planning]	The model enables WRAP impacts to be quantified using consistent assumptions. It takes verified impact data on a number of indicators (e.g. tonnes of waste diverted from landfill, tonnes of CO2 equivalent carbon emissions avoided) and applies factors for attribution, lifetime and costs to derive net impact data. It also includes spend data allowing return on investment to be calculated.	Essential for ensuring WRAP's impacts can be reported reliably. The model was developed in response to criticisms from the National Audit Office that the impacts of the previous BREW programme were not properly captured and reported.	The model was developed over a period of three years and has undergone several rounds of improvement. The model is populated by an external contractor which has its own quality checks. The model is then checked by WRAP project manager. The model is shared with the Defra policy lead who is at liberty to carry out his own checks.	•	•	•	•	•	•		•		•
Defra	Thames Tideway Tunnel financial model – developed by KPMG on behalf of Thames Water Utilities Limited (TWUL). [Procurement & Commercial]	The model has been developed by KPMG for TWUL with input from HM Treasury, Ernst & Young (on behalf of Defra), and Ofwat. It is available to all those organizations and will be used for the development of the delivery structure of the Tunnel and its procurement and models the project up to 2133. It is commercially confidential and so is not available to the public (and at the time of writing is still under development).	The model is critical to inform decision making on the delivery structure. So it carries significant reputational risks for TWUL but also the other parties with access to the model.	KPMG owe a duty of care to TWUL and will test it with TWUL. It will be subject to independent third party review at the appropriate stage and access to it by the other parties ensures a level of transparency.	•	•	•	•		•		•		•
Defra	BSE back calculation model. ALB - Animal Health and Veterinary Laboratories Agency (AHVLA). [Science-Based]	Estimates the infection prevalence in each birth cohort for cattle born after 1 August 1996 to check that the prevalence is declining as expected and highlight if any significant changes.	Used to determine the UK's current BSE status and demonstrate progress towards becoming BSE free. Any increase in BSE prevalence could have serious consequences so would need to be detected rapidly.	Developer testing, internal peer review, external peer review, audit against QA standards, in public domain.	•	•	•	•	•			•	•	•
Defra	Exodis-FMD ALB - Animal Health and Veterinary Laboratories Agency (AHVLA). [Science-Based]	To forecast the potential range of outcomes and resources used in an outbreak of FMD, as well as monitoring disease control. Used between outbreaks for developing contingency plans and investigating control options including vaccination.	Part of AHVLA's preparation against the highest priority disease threat, a Foot and Mouth disease outbreak. Foot and Mouth response has the greatest potential impact on AHVLA reputation.	Developed by an external company, internal peer review, external peer review, full documentation and training courses available. Comparison with equivalent models, repeated high profile use.	•	•	•	•		•		•		•
Defra	BoTMEW (bovine TB model for England and Wales). ALB - Animal Health and Veterinary Laboratories Agency (AHVLA). [Science-Based]	To generate analysis and predictions of regional and national impacts of multiple control measures in order to allow evaluation of control options. Preparation, projection and monitoring of a bovine TB eradication plan. Outputs the distribution of TB breakdowns, undetected infected cattle and infection in wildlife.	Likely to be essential for the development of future Bovine Tuberculosis eradication plans.	Rigorous developer testing, validation of historical runs, internal peer review, external peer review intended, complete development record, audit against QA standards, detailed specification independent of code, specific guidelines for most reliable use, new model replacing a previous model.	•	•	•	•	•	•		•		•
Defra	Pollution Climate Model (PCM) (outsourced to external consultancy (Ricardo-AEA), GIS-based air quality dispersion model). [Science-Based]	Model provides estimated concentrations for key air pollutants at background locations (1x1km maps) and at roadside locations (approx. 10,000 major road links) to calculate population exposure, area and road length exceeding European Limit and Target Values. Outputs are visual map images, GIS data layers and compliance summary information that inputs to the '461 Questionnaire' submitted to European Commission annually.	Model outputs form a significant part of UK's assessment of compliance with Directives. UK's monitoring network alone is not compliant with Directives therefore without model this could engender serious financial penalties. Without the use of the model the UK would be liable to infringement proceedings leading to possible infraction.	Developer testing, internal peer review, external peer review, use of version control, quality assurance guidelines, governance, transparency, assessment of model fitness.	•	•	•	•		•	•	•	•	•

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Defra	WRF-CMAQ Air Quality Forecasting Model (outsourced to external consultancy (Ricardo-AEA)). [Science-Based]	The meteorology model (WRF) uses the global weather forecast to create a European and UK forecast suitable for use in the air quality model (CMAQ). The air quality model uses the calculated weather forecast and emissions to predict air quality. Maps of the air quality predictions for five pollutants on a 10x10km resolution for a 24–48 hour time period.	As well as providing important information to the public, the forecasts are a requirement of 2008/50/EC on ambient air quality and cleaner air for Europe.	Developer testing, internal peer review, external peer review, use of version control, quality assurance guidelines, governance, transparency, assessment of model fitness.	●	●	●	●		●	●	●	●	●
DfE	Pupil Projections Model (PPM). [Forecasting]	The model projects the numbers of pupils in England to help planning and funding decisions, study trends and to inform a variety of programmes and initiatives. The model uses ONS mid-year population estimates and projections and converts these to population by academic age. Existing pupil participation figures from a variety of approved data sources (e.g. School Census, Labour Force Survey) are then utilised to project trends in participation for under 5's, those of compulsory school age and post 16 pupil populations. Projections are published twice yearly in an Official Statistics Release.	Future pupil numbers are key pressure on education going forward. Projections are used to estimate future teacher demand and assess risks around adequacy of existing supply. Estimates are a critical element when considering funding requirements and are utilised in the Dedicated School Grant (DSG) funding model and as a consistency check on LA forecasts utilised for capacity planning.	The model undergoes an independent internal review every 1-2 years and the accuracy of model projections are reviewed by the lead analyst as actual pupil counts become available twice a year. At these points senior analysts agree model development priorities. All changes and updates to the model are made and documented by the lead analyst and quality assured by a second analyst. The team work closely with Office for National Statistics to confirm the assumptions utilised and outputs obtained. A senior analyst and the Chief Analyst/Statistician review the outputs to sanity check conclusions before revised results are published in a Statistical First Release and utilised internally.	●	●		●		●		●	●	●
DfE	Teacher Supply Model (TSM) [Forecasting]	The model estimates future teacher demand arising from demographic pressures, planned policies (such as for example changes to curriculum and qualifications) and measures the flows of qualified teachers in and out of the state funded teaching sector to estimate the size of the gap in the workforce that Initial Teacher Training needs to fill. The model derives estimates for recruitment into initial teacher training that aim to minimise the over- and under-supply of teachers. The model is currently updated and run twice a year to coincide with the allocation of ITT places and the timeliness of source data. Interim modelling is completed in the autumn and usually finalised in the winter/spring.	Primary use of modelling is to inform the allocation of English initial teacher training (ITT) places. The modelling outputs are also used to inform policy development, costing of bursaries and to support operational delivery of ITT.	An on-going programme of model improvements are approved at G6 level. Changes are implemented by a lead analyst and quality assured by another. Expertise from appropriate areas is exploited to inform input assumptions. QR of inputs is done by providers with analysts reviewing and sense checking these so the impact of changes and sensitivity of the model to assumptions is understood. All model outputs are documented and reviewed with key stakeholders within the Department each time the model is updated and run. This feedback is then fed into the model prior to final targets being set and clearance being sought from a G5 analyst. Periodic reviews of the full model are also completed with the most recent taking place in winter 2011/12.	●	●		●		●		●		●
DfE	Initial Teacher Training (ITT) policy funding model. [Planning]	The model projects the annual cost to the Department of the funding offered to trainees on the main postgraduate and employment-based Initial Teacher Training routes. It is spread sheet-based and takes as inputs a range of intake targets supplied by another DfE model - the Teacher Supply Model. These are differentiated by factors such as route and subject, and the model applies a series of behavioural assumptions and policy parameters to forecast aggregate costs. Inputs and assumptions can be varied to perform analysis of policy options.	It is important for the Department to have robust projections for the costs of key DfE-funding Initial Teacher Training routes to ensure the financial impact of policy decisions can be determined and to help financial planning.	A single analyst has overall responsibility for maintenance and development of the model. Changes made to the modelling approach are documented in an updated user guide, and are quality assured by other analysts from the same division, with sign-off by a more senior analyst. Key outputs from the model are quality assured by other analysts, with the results and assumptions used consistently documented. Policy colleagues are consulted on input assumptions for the purposes of policy analysis and revising key projections.	●	●		●		●		●		●
DfE	Pay bill Model (PBM). [Forecasting]	The model provides projections of future teacher pay bill costs. It uses annual data on full-time equivalent regular teacher numbers and teacher distributions across pay scales (pay spine distributions taken from the School Workforce Census) and projects these. Projections utilise assumptions about changes in teacher numbers, progression rates, wastage rates and re-entrant rates based on past experience and assumptions about future behaviour. On-cost rates (pension contributions and National Insurance contributions) are derived separately and applied to the pay bill model. Outputs are frequently published in submissions of evidence to the School Teachers Review Body and to assess the impact of their recommendations on teachers pay. Projections of overall pay bill costs are provided annually to HMT and utilised in Spending Review calculations.	Utilised to impact assess policy decisions relating to teachers pay and funding and planning decisions that are influenced by teacher pay bill costs .	The most recent internal periodic review of the model was completed in winter 2011/12. An annual programme of model improvements is approved annually at G6 level when the model is updated with the latest data on actual teachers pay. Changes and updates are implemented and documented by the lead analyst and quality assured by another. Appropriate expertise is exploited to inform input assumptions and the providers are involved in quality assurance of the model outputs. These are sense-checked and reviewed by analysts within the team so the impact of changes and sensitivity of the model to assumptions is fully understood. All model outputs are documented and reviewed with key stakeholders within the Department each time the model is updated and run. All results are cleared by the team leader. OME hold a previous version of the model and are updated on developments with the model.	●	●		●		●		●		●
DfE	National cost model for Free School Meal eligibility [Policy Simulation]	The model estimates the costs to English schools of alternative free school meals policies, including entitlement thresholds and transitional protections. The model is currently used for analysis of entitlement policies under the introduction of Universal Credit. It takes as inputs (a) scenarios for eligibility numbers from other DfE or DWP analyses and (b) assumptions on the unit cost of meal provision and take up from research. It is currently used for analysis of entitlement policies, including transitional protections under the move to Universal Credit. The model generated aggregate cost figures for comparison of alternate scenarios of eligibility. It can potentially can be used for other purposes, such as analysing the impact of changing unit costs or take-up.	Policy decisions on free school meals entitlement have a significant influence on school costs, provision for disadvantaged pupils and the delivery of Government priorities in relation to school food and welfare reform. It is important that impacts are appropriately assessed in relation to these decisions.	A single analyst has responsibility for maintenance and development of the model, working collaboratively with members of another analytical team in the same division. Any changes in modelling approach are developed jointly and documented, with quality assurance and sign-off provided by a G7 in the second team. Any outputs from the modelling are documented and checked for plausibility and consistency by the second team.	●	●		●		●		●		●
DfE	Workforce Implication Assessment Modelling [Planning]	This is an Excel-based model that utilises pupil counts and projections (from Pupil Projections Model), teacher data by specialism (from annual School Workforce Census) and assesses the impact on future teacher demand of changes in policies relating to for example, qualifications and curriculum. The output is a time series of teacher requirements across different institution types and teacher qualification levels under different policy scenarios.	Assessing the impact of policy changes to workforce is essential to enable full assessment of policies and inform planning decisions; in particular to inform decisions around initial teacher training requirements.	The model undergoes an independent internal review every 1-2 years and is updated on an on-going basis as requirements change. Changes and subsequent updates to the model are agreed at G6 level, implemented and documented by the lead analyst and quality assured by another before results are used. Assumptions utilised in the modelling are developed in conjunction with appropriate experts who are involved in the quality assurance of the model. Outputs of the model are compared against previous analysis to check consistency and to sanity check conclusions being reached. These are signed off by the G6 analyst.	●	●		●		●		●		●
DfE	ITT Allocations Model. [Allocation]	The ITT Allocations model determines the availability of initial teacher training (ITT) recruitment and training across England. The model identifies cohorts by subject and training route as well as including factors such as identifying places eligible for bursary funding and School Direct demand. The model is adjusted (on an auditable change basis) according to provider desire to recruit additional trainees or surrender allocated places where unable to recruit. The model covers the entire range of ITT allocations (excluding Teach First) from the Teaching Agency to the initial teacher training sector in England. Once training supply based on sector need is identified, the model allows the allocations team to distribute specific allocations of ITT places to individual providers based on the quality of provider and their ability to recruit. As changes are notified from the sector, the model redistributes or generates additional allocations to providers to allow sector-led demand to influence allocation of funded places. When finalised, model outputs are fed to Teaching Agency funding teams who can calculate provider level and programme level funding liability based on subject, funding route and trainee numbers.	The model establishes the allocations position for up to 40,000 teacher training places, and by determining the number of places distributed to each organisation delivering training, it ascertains the spread of ITT funding. One of the Teaching Agency's key objectives is to match good quality training provision and the supply of the workforce to Ministers' priorities and the specific needs of the sectors. By determining who is delivering training (and to what extent) it ensures that places are allocated to high quality providers and aims to meet the demand for places by subject and location. If the model incorrectly applies agreed allocations criteria and therefore miss-allocates places to providers, then the results could be challenged by training providers. This may also have financial implications or cause reputational damage. It should be noted that the allocations modelling sets initial place levels and there is opportunity for negotiation on revisions, based on changing circumstances and priorities.	The model consists of a series of applications of criteria relating to the number of places available for teacher training. The model requires that the data driving decisions is valid and the algorithms using the data to calculate cohort numbers are appropriate. For quality assurance purposes, the data's sources and accuracy are checked before being applied. The algorithm calculating places is a series of formulae which uses the source data, and these are tested for accuracy and appropriateness, with error traps. Overall and interim totals are checked and verified, ensuring consistency.	●	●		●			●			●
DfE	Dedicated Schools Grant pressures. Spreadsheet based projection model. [Forecasting]	The model is used to provide an early indication into potential pressures on the Dedicated Schools Grant (DSG) budget for planning and internal budgeting purposes. This simple model is Excel based and provides an early estimate of the potential cost and demographic pressures for 2015-16 to 2017-18 at a national level which may be faced. Considers basic pressures arising due to demographics, i.e. additional pupils, implications of teacher's pay agreements, etc.	Critical for longer-term affordability and budget discussions.	Any new aspect is developed by one team member and then quality assured by another. This is supplemented by sense-checking of results internally and by policy.	●	●		●		●		●		●

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DfE	Dedicated Schools Grant pupil projections. Spreadsheet projection model, cohort based. [Forecasting]	The model is used to generate Dedicated Schools Grant (DSG) pupil projections for the next 4 financial years and to collate all the different projections into what it means for the DSG envelope looking ahead. Used to update the position regularly. This Local Authority level model is Excel based and consists of several main sub-models: pupils over 5, pupils under 5, Alternative Provision and others. For over 5s, we look at the past rate of entry at age 5, and past conversion rates of 5 year olds into 6 year old and so on. For the alternative provision census, we use a simple forward look using a weighted average of the last three years. For under 5s, we look at the past participation rates for 3 and 4 year olds, and apply to the latest population projections.	Critical for shorter-term affordability and budget discussions.	Any new aspect is developed by one team member and then quality assured by another. The pupil projections are updated regularly in line with the relevant census data published. The model is updated by lead analyst within the team and quality assured by another analyst. The model is developed and updated over time, as the school funding system changes. There is a user note outlining the folders, methods, assumptions and data used to generate the DSG pupil projections and detailing possible areas for further work, given future developments and potential changes to the school funding system.	●	●		●		●				●
DfE	Academy and Free School costs and pressures model. Financial forecasting and scenario planning tool. [Planning]	The model is used to provide cost estimates to support forward planning of Academy and Free School programme, through an assessment of budget requirements in short-medium term. To help ensure the department can retain effective control of its overall budget. Currently non-recoupable costs (i.e. the additional costs of being an Academy), but in future all costs to be covered. Spreadsheet based tool. Applies a range of unit cost assumptions for different aspects of funding to rollout scenarios. Includes aspects of start-up and on-going funding. Allows for opening on a monthly basis and for payment schedules on a monthly basis. Assumptions on unit costs based partly on historical evidence and partly on policy agreement for anticipated change.	Critical for budget planning.	The tool is developed and updated over time, as policy develops. We recently moved to a new and improved model to ensure we have effective analysis. Any new aspect is developed by one team member and then thoroughly checked by another. This is supplemented by sense-checking of results internally, by Education Funding Agency analysts and by policy.	●	●		●		●	●	●		●
DfE	Academy Trajectories. [Planning]	The model is used to provide projections of future numbers of Academies by type and phase to support forward planning of Academy rollout programme. Used to calculate cost and pressure estimates related to the programme. Model is Excel based and projects numbers of Academies by type and phase for two different scenarios (low and high) for Financial Years 12-13 to 14-15. Based on the published open Academy and pipeline lists and data from internal trackers a range of assumptions are applied (time taken from application to opening, slippage rate, seasonality, etc.).	Underpins planning and consequential cost projections.	The tool is developed and updated over time, as policy develops. The trajectories are updated on a monthly basis in line with the open Academy and pipeline lists that are published on the Department's website on (usually) the first Friday of every month. Any methodology changes are updated by lead analyst and quality assured by another analyst. The model is updated monthly by lead analyst and built-in self checks are performed. This is supplemented by sense-checking of results and clearance from relevant policy group.	●	●		●		●		●	●	●
DfE	National Funding Formula: Schools Block Spreadsheet based calculation and modelling tool [Policy Simulation]	Its purpose is to model the impacts of funding scenarios for the deployment of a national funding formula. The model produces impacts at individual school and academy level. This is a new model, development started in summer 2012. If and when implemented, a new national funding formula will impact all schools. Model is spreadsheet based, and is a flexible tool to allow different scenarios for a national funding formula to be modelled. For example the different formula factors, setting the floor and ceiling, and overall budget. Uses school level data (e.g. number on roll, deprivation) to produce school level funding projections, and the subsequent changes in their funding in a particular scenario. As the work progresses data will be used from the new LA proformas.	Fundamental to ensure equity and operability of new funding system and to estimate protection costs.	The model was thoroughly checked by the team leader whilst being built, and has also under gone further checks by an independent analyst: testing the assumptions, consistent formulas, checking coding and VBA, etc. Comments from this, and changes made have been documented. The model is documented within the spreadsheet, and is supported by a user manual. The model is now ready for policy options and scenarios to be modelled. QA is in place to check the outputs as we go forward.	●	●		●		●				●
DfE	Local Authority tool. Spreadsheet based funding planning and allocation tool. [Financial Evaluation]	The tool was provided to LAs through the DfE website, enabling them to model their formulas under DfE's proposed funding changes for 13-14. It is a spreadsheet tool that takes LAs through the process, identifying current school level budgets and mapping these to current formula. Then enables the LA to test different scenarios under the new arrangements. It was a proof of concept, in that it takes the new policies and turns them into a practical tool/representation. The tool itself as provided is blank. LAs populate the tool directly themselves.	Important part of ensuring success of funding reform.	There was not a separate build of the tool. It underwent a thorough process check – tested for the underlying match to policy; formula testing; and usability. LAs were used for limited user acceptance. Three versions of the tool were released, as the policy definitions changed and bugs were removed. No further versions are planned. Some documentation of QA plan. Log of user/tester feedback, with audit trail of changes to later versions.	●	●	●			●			●	
DfE	Pupil Premium Spreadsheet calculations [Financial Evaluation]	The model is used to calculate the rates for Pupil Premium for deprivation and Looked After Children. It is a spreadsheet model that allows for different scenarios to calculate the unit value of the Pupil Premium, at a national rate. Data is used from the School Census, SSDA903 return on looked after children, pupil projections, and economic considerations of the changes in the number of pupils on free school meals. As the unit value relies on projections, this has tended to leave an under spend of the Pupil Premium budget once the figures from the January census are available. There is then consideration of how to handle the under spend, which has resulted in further allocations to schools.	Impacts on funding levels.	The model was rebuilt for the 13-14 calculations, to improve the flow and transparency in the spread sheet and so easier to use. The assumptions were defined with Funding Policy Unit. The calculations were checked, and sense checks carried out. The actual payment model is held by Education Funding Agency, so again there is a dual check there.	●	●		●		●				
DfE	Local Authority Level Free School Meal Eligibility as we move to Universal Credit (transitional protection) Spreadsheet modelling costing tool to support policy development. [Policy Simulation]	The model shows the cost (at local authority level) of free school meals as we move to Universal Credit, including transitional protection costs and covers the issue of a change in the distribution of eligible pupils across local authorities. Different teams across DfE are looking at the impacts of Universal Credit – the main interest from this model is the impact at local authority level. This is a spreadsheet model, showing the numbers of pupils losing or gaining free school meal entitlement under Universal Credit, summarised at LA level. The model allows different transitional protection options to be tested. The model takes as inputs (a) scenarios for eligibility pupils from other DfE / DWP analysis and HMRC LA level data on the number of eligible pupils eligible for Universal Credit under a given income threshold (b) assumption on unit cost of meal provision from research.	Will assist in determining appropriate entitlement threshold.	The model has undergone various levels of quality assurance – formula checking, sense checking, the model has been reviewed by another analyst ensuring the correct data was being pulled in and all calculations were correct.	●	●						●		

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DfE	Post-16 strategic (schools, colleges and apprenticeships). Spreadsheet based scenario planning tool. Cohort based. [Planning]	This model is used to inform 16-19 policy development and to estimate the costs of delivering the expected volume and mix of provision for budget planning purposes. Spreadsheet model tool. Implements a cohort-based methodology (based on prior attainment/participation depending on age) to project participation rates at age 16, 17 and 18 incorporating the expected impact of new policies. It then estimates the costs by converting participation rate trajectories into DFE funded volumes using ONS population projections and historic relationships, and then applies unit cost assumptions that reflect the expected additional cost drivers expected as participation levels increase at ages 16 and 17 in particular.	For longer term planning of cohort participation and cost projections.	The key inputs to the Strategic Youth Model (SYM) are quality assured/scrutinised as part of the 16-19 Funding Statement process, which involves modellers, funding policy and policy from DFE, Education Funding Agency (EFA) and Skill Funding Agency (SFA). The projection methodology has remained relatively stable since the model was built and thoroughly quality assured 4 years ago. However, additional 'bolt-on' elements have been developed and new functionality added which have often been done at pace and therefore not always as clearly as would like and/or comprehensively documented. We have conducted a review of the current model design, and methodology, and are in the process of building a new model (SYM2) using spreadsheet design best practices. We have also thoroughly quality assured the current SYM recently, pending the new model being completed, and will then run the two models in parallel as part of the QA procedures of the new model. The outputs from the SYM model (and the model itself) are shared with EFA modelling counterparts as part of QA process and ultimately signed off by senior policy and funding colleagues. QA process for mostly internal ad hoc requests using team's models is currently under review as part of a team level knowledge management and process review exercise.	•	•		•		•			•	•
DfE	Academy start-up grants. Spread sheet calculations. [Allocation]	The model was built to develop a formula to calculate the start-up grant for different types of schools (academy, free schools, University Technical Colleges) as part of the review on Start-Up funding for Academies. Spreadsheet development model, which used previous data on start-up grants by type of school, to produce a much simplified and uniform way of calculating state-up grants. An equation has been developed for each type of school, such as secondary sponsored academies, and a new free school.	Drives funding decisions.	The model uses start-up funding allocations for existing academies. Since there were not many primary academies, some dummy primary academy allocations were created to test out the different options. The actual and dummy allocations were all sense checked by another team member and funding policy colleagues were made aware of this. Assumptions on number of staff and costs were agreed with funding policy colleagues and each version of the models have been quality assured by an existing team member by looking at the input data, the assumptions (e.g. number of staff), the calculations within the model and the results.	•	•		•		•				•
DfE	Academies (replication models). complicated replication of LA formulae within spreadsheets. Funding Allocations. [Allocation]	The model is designed to calculate the level of funding to be allocated to Sponsored academies, principally. those whose funding is based on replicating the Local Authority formula. There is separate model built for each LA. The model replicates the level of funding by LA. Each model is then copied to a separate tab to be populated by specific Academy data.	Calculates funding allocations for academies in line with local LA school formula.	The model is built by a funding/analyst specialist. The LA model is QA'd in a two stage process by a peer review and a higher level review. All review comments are noted on a QA sheet and have to be cleared prior to progressing onto the next stage. When cleared, the academy level data is collected and added. Receipt of the data is reviewed against previous year data and QA'd. Once satisfactory, the data is input to the LA model and receives a two stage QA. Once again, a peer review and a more senior review. All outputs (allocations) have a final review prior to issue.	•	•		•		•		•	•	
DfE	Academies (converter). Spreadsheet based calculations. Funding allocations. [Allocation]	The model is designed to calculate the level of funding to be allocated to Converter Academies. Models are based on geography (several LAs in each model) and are currently Excel based. Each model contains summary information from multiple LA section 251 data submissions. Models also calculate the additional 'LACSEG' funding to be provided to Academies	Calculates funding allocations for academies in line with local LA school formula.	The model template is built by a senior Analyst and QA'd as part of this process. Section 251 data is then added and QA'd by two further analysts within the territory prior to sign off of the model by a Band 6. If changes are required to the s251 data, these are carried out by an analyst and signed off by the territorial B6. Such changes should only be carried out once agreement has been sought from both the Academy and the local authority and the evidence of these agreements are logged within the model itself and each model operates version control.	•	•		•		•		•	•	•
DfE	Dedicated Schools Grant allocations and payment schedule. Grant Distribution Model [Allocation]	The model is used to calculate how the annual Dedicated Schools Grant budget is allocated to Local Authorities, and paid in 25 instalments during the course of each year. It is based in Microsoft Excel. For the Schools Block and Early Years Block of DSG the model is straightforward in principle: pupil counts from the various schools censuses are aggregated together to produce total eligible pupil estimates for each LA. These are then multiplied by each LA's per-pupil block units of funding (the BUF). There is some additional complexity (e.g. cash floor; amounts to deduct for recoupment for academy funding, which are separately calculated by EFA) but overall the model is simple. For the High Needs Block of DSG, the model for deriving these allocations is listed in a separate line of this table.	Distributes funding annually to LAs for onward distribution to schools.	The model to calculate DSG allocations is built independently by three analysts, and results checked to ensure that identical allocation amounts are produced. DfE Education Data Division are responsible for QA of the census pupil counts. Further QA sense checks are carried out such as investigating differences from previous years' allocations. Calculations are also reviewed by DfE Internal Audit. The pupil counts and the sequence of calculations behind the allocations are published on the DfE website, giving LAs (and anyone else) the opportunity to review and highlight if they think an error has been made.	•	•	•	•	•	•		•	•	•
DfE	Pupil Premium allocations and payment schedule. Grant Distribution Model [Allocation]	The model is used to calculate how the annual Pupil Premium (PP) budget is allocated to schools and Local Authorities. It is straightforward in principle: pupil counts from the schools censuses and the SSD903 Looked After Children return are aggregated together to produce total PP-eligible pupil estimates for each LA, then multiplied by Pupil Premium per-pupil funding amount.	Distributes funding to schools.	The model is built independently three times. Education Data Division undertake collection and QA of the census pupil counts, and produce the principal calculation of PP allocations. Two analysts within the EFA separately build two further models and the results are checked to ensure that three identical allocations are produced. Further QA sense checks are carried out such as investigating differences from previous years' allocations. Calculations are also reviewed by DfE Internal Audit. The pupil counts used to derive the allocations are published on the DfE website, giving users opportunity to highlight if they think an error has been made.	•	•	•	•	•	•			•	
DfE	Education Services Grant. Grant Distribution. [Allocation]	The model is used to calculate Education Services Grant (ESG) rates, and allocations to LAs. Excel is used to carry out the calculations. Planned expenditure lines from S251 budget returns are aggregated, with some assumptions applied, to calculate the total ESG funding. This is are divided by School Censuspupil counts to derive ESG rates; then multiplied back by pupil counts to derive LA allocations.	Distributes ESG funding.	The model is built independently twice, and checked to ensure identical results. The dual-run covers the full derivation of total ESG funding amounts, derivation of ESG rates and calculation of LA allocations. The full specification of data used and the calculations are set out in the ESG Technical Note, which is published on the DfE website; internal peer review ensures the calculations match the specification. DfE Education Data Division are responsible for QA of the census pupil counts. The dual run approach has not always been carried out in the past but this is being made mandatory for 2013-14 onwards.	•	•		•		•		•	•	
DfE	DSG High Needs Block (pre-16). Grant Distribution. [Allocation]	The model calculates DSG High Needs Block funding allocations to Local Authorities for 2013-14, as per the departmental reforms, for all LAs, schools and academies in England. Calculations are done in Excel. High Needs Places data returned by LAs are aggregated to adjust planned expenditure for 2012-13 (from S251 Budget returns) into 2013-14 allocations. Complexity arises from adjusting 2012-13 expenditure to account for High Needs pupils placed by the responsible LA into provision run by another LA.	Distributes funding.	QA checks include peer reviewing/checking by analysts of the formula calculations in the spreadsheets containing the calculations, and sense checks of the outputs (e.g. against census and provisional allocations calculated previously). Calculations have been determined in close consultation with policy leads to ensure they are implementing the right computation, and reviewed by DfE Internal Audit as part of their DSG work. Two provisional cuts of the allocations, including details of the calculation steps, have been shared with LAs, giving them the opportunity to review and inform the department of corrections needed.	•	•		•	•				•	•
DfE	Capital pre-16 (Basic Need). Spreadsheet calculation. Grant Distribution. [Allocation]	The model is used to calculate annual allocations of Basic Need funding to Local Authorities for the provision of school places. School Capacity (SCAP) Survey data (provided by LAs) on school capacity and forecast pupil numbers are fed in to the Excel model. The model itself is relatively simple, actioning a number of mathematically simple calculations. Complexity arises from processing aggregating the source dataset to the level required for input into the model. This includes making adjustments to account for pupils in middle-deemed schools; the process is simple but involves large datasets.	Distributes funding.	The model for calculating allocations is built independently three times and the results are checked to ensure that identical allocation amounts are obtained. Outputs are sense-checked, including review by non-analytical colleagues. Raw SCAP data are validated by EFA Pupil Place Planning team. A macro has been developed to convert the SCAP data from the format of raw collection into model inputs; further spot-checks and other validation is undertaken. A past weakness has been that the models have lacked detailed metadata and robust documentation, making validation and other auditing more difficult than necessary, which is being addressed for the 2013-14 allocations.	•	•		•		•		•	•	•

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DfE	Capital pre-16 (DFC and Maintenance) Spreadsheet calculations. Grant Distribution. [Allocation]	The purpose of the model is to calculate annual allocations of Devolved Formula Capital and Maintenance Capital Funding to schools, Local Authorities and academies. The models are Excel based, and fairly straightforward in principle. For DFC, pupil counts from the school census at school level are multiplied by per-pupil funding amounts, then aggregated to generate allocations. There is some complication due to different per-pupil amounts depending on school type and school phase. For Maintenance, a total pot is allocated pro-rata to the DFC allocations, although with adjustments for differential funding rates for Voluntary-Aided schools compared to non-VA, and also weighting based on data from the School Building Survey relating to school modernisation. In both cases the complexity arises from the fact that data processing must primarily be done at school level, and that as a result the datasets are large.	Distributes funding.	The model for calculating allocations is built independently three times, and the results checked to ensure that identical allocation amounts are obtained. Outputs are sense-checked, including review by non-analytical colleagues. The census input data is validated by Education Data Division. A past weakness has been that the models have lacked detailed metadata and robust documentation, making validation and other auditing more difficult than necessary, which is being addressed for the 2013-14 allocations.	•	•		•		•		•	•	•
DfE	Early Years: revenue and capital funding for 2 year olds Spreadsheet modelling tool [Policy Simulation]	The model was originally used to option test the allocation of revenue funding for the new eligibility criteria for deprived 2 year olds. The model has now been handed to EFA, and was used for the allocation of 13-14 revenue and 12-13 capital allocations. The model is spreadsheet based. Data does not exist giving a direct, full count of eligible 2-year-olds, so the model uses a proxy. This is based on HMRC data, estimating the 2 year old count from a count of eligible 4-6 year olds using linear regression. This derives a count of eligible 2 year olds per LA.	Drives funding decisions.	The methodology and processes have been checked within the DfE team developing the model, in close collaboration with policy colleagues, and reviewed by senior analysts. Calculations of the allocations are carried out independently twice, and the results checked to ensure that identical allocation amounts are obtained. The model has been documented.	•	•		•		•		•	•	
DfE	High Needs post 16. Spreadsheet calculations. Grant Distribution. [Allocation]	The model is designed to calculate the 16-19 element of the High Needs Students funding block that goes to local authorities. Calculations are done in Excel. High Needs Students data is taken from school and college data returns and shared with LAs. These numbers are adjusted by LAs to take account of future planned delivery and returned to the EFA, where they are used to calculate three elements of funding – a 'mainstream funding' element and an 'additional learning support' element that is paid direct to schools and other institutions, and a third 'pupil' element that is paid to the LA to distribute as it sees fit.	Distributes funding.	Initial estimates of student numbers are rigorously checked by EFA territorial teams, with a QA process strictly adhered to. Once the QA process is completed, the estimates are submitted to both LAs and the individual institutions who agree future student volumes according to local need. The LA then submits revised student estimates, which again go through a strict QA procedure in the EFA territories before being collated nationally. Funding elements 1, 2 and 3 are calculated according to 16-19 business rules before going through a final QA check by the Funding Allocations team. Once allocations have been made, local authorities have a final chance to amend their numbers.	•	•		•		•		•	•	
DfE	Post-16 (schools, Academies and FE) SQL based system calculations Grant Distribution [Allocation]	There are three separate models here: The annual funding allocations. The conversion on annual funding allocations into a monthly payments model. A clawback / reconciliation model where Independent Providers' under-recruitment results in funds being returned. The 16-19 budget is allocated to over 2,000 schools, academies and FE providers. The models are based in an SQL environment, linked directly to a series of SQL databases which automate calculations for institutions. There is a small manual process to allow for exceptions (those that have different funding agreements) and figures amended where there are significant data concerns. Annual allocations are converted into monthly payment schedules according to set rules. Clawback processes vary each year – but the principle remains the same – in-year and end of year data is monitored to identify under-delivery against profiles, with those delivering less than 95% of their agreed numbers subject to clawback.	Distributes funding.	Calculation of annual funding allocations is a well established process, with initial allocations shared with institutions in January, to allow institutions themselves to query accuracy of data / prepare business cases for exceptions. Both initial and final allocations go through a vigorous QA process, with different teams QAing the initial calculations; the conversion of annual allocations into monthly payment profiles goes through detailed QA as well, with analysis colleagues in the Finance department reviewing calculations carried out by the funding allocations team; clawback is done using QA'd ILR data.	•	•	•	•	•	•	•	•	•	•
DfE	16-19 Bursary Grant Distribution [Allocation]	The model is used to calculate 16-19 Bursary funding allocations. This is the £180mil budget used to fund those from low level income families. The allocations are calculated through fairly simple Excel-based models that contain data for each institution on the number and proportion of students who received an EMA band 1 (£30/week) payment in 2009/10, along with the number of students expected in 2012/13, and the number of students who were in receipt of a 'vulnerable learner' payment in 2011/12. Allocations are consistent with previous years' payments, adjusted only for student numbers	Distributes funding.	The model is thoroughly QA'd by the EFA's learner support team, before allocations are made to the institutions. A small fund is kept back for business cases, which institutions are invited to make in exceptional circumstances where the number of students from disadvantaged areas are higher than expected. These business cases are reviewed on an individual basis according.	•	•		•		•		•		•
DfE	High Needs post 16 Spreadsheet tool to test impact of alternate funding methodologies [Policy Simulation]	The model has been developed to test the impact of new funding methods on local authorities and institutions. Data from census and ILR returns are drawn into an Excel model to estimate the overall amount of funds allocated to a LA area under current funding arrangements. The data is split into individual institutions taking students from each LA, and estimates of funding for each is made. Options for how to allocate the funding according to new funding guidance are commissioned by a Steering Group.	Would drive funding allocation so essential to ensure equity.	This input data is QA'd by territories who work with institutions for whom they are concerned about data accuracy, according to QA processes laid out by an EFA steering group. The model fits the EFA's modelling best practice guide in format and content, and the impact of the options of how to fund are QA'd through a task and finish group.	•	•		•		•				
DfE	Post-16 funding formula (schools, Academies and FE) Spreadsheet based scenario modelling tool to investigate impact of new funding system [Policy Simulation]	Model has been developed to test the impact of changing the elements of the 16-19 mainstream funding formula. The funding development model is an Excel-based scenario-based tool which includes information for each institution on a range of historic and future funding factors that allows the user to select any combination of proposed funding options and compares each institution's previous and current funding, as well as summary outputs.	Will drive new funding system design.	The model has well documented processes and follows the EFA best practice guide. The model has been through internal QA and outputs are reviewed at modelling groups and working groups.	•	•		•		•				
DfE	16-19 Bursary Funding development model. [Policy Simulation]	The model has been developed to test the impact of new funding methods on all institutions who previously had students in receipt of EMA funding. Based on the bursary allocations model, the development model includes information for each institution on a range of alternative measures ranging from geographical area measures, to funding measures such as free school meals eligibility and disadvantage uplifts. The model is scenario driven, offering up many combinations of factors and implementation periods.	Drives funding decisions.	QA process is pretty simple, with an analyst in the Learner Support team checking the work of the analyst in the Analysis and Modelling team with outputs further checked at through a working group.	•	•		•				•		•
DfE	Academies in-year financial forecasting Spreadsheet based forecasting model. [Forecasting]	The model is designed to provide EFA (and in turn DfE) a summary of the amount of money the EFA expects to spend on the Academies programme in the current and subsequent year. Spreadsheet-based forecasting tool, applies a range of unit cost assumptions for new / converter academies alongside payment profiles for existing academies to produce monthly in-year forecasts on EFA academy costs.	For budgetary control.	The tool is updated monthly with actual payments and revised trajectories and each forecast goes through a QA process with one analyst updating the model and another checking it. This is supplemented by sensibility checks by DfE Analysts who use the model to inform their longer term strategic model.	•	•		•	•	•		•		•

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DfE	Post-16 short term (schools, Academies and FE) Financial forecasting and planning tool [Forecasting]	The model is used to inform funding policy of the likely costs of 16-19 year olds participating in education / training in future years; this is actually a series of individual models that look at participation in different types of institutions, alongside projections of those not in education / training. These models all then feed in to an overarching model which is where most of the QA / Peer review work is done. The model covers over 2,000 institutions. The spreadsheet-based model takes current / historic participation, achievement and costs information, alongside future population data and a series of policy and data assumptions to project forward future levels of participation and costs in 16-19 institutions.	For shorter term planning of participation and funding so drives funding decisions.	Only data from approved sources – ONS, the FE Data Service, DfE's Data & Statistics Division and from BIS – are used to feed into the modes, which all confirm to an EFA Best Practice Guide; the model itself and the data assumptions used in the model are peer reviewed by a team of analysts within the DfE's IFLAD team, whilst policy assumptions are agreed with Funding Policy colleagues in both EFA and DfE. The outputs of the model are QA'd through a) an analysts' working group and b) a technical group made up of analysts and policy colleagues before finally being agreed and signed off at a Steering Group headed by senior civil servants.	•	•	•	•	•	•		•		•
DfE	Primary and secondary school basic need for places forecasting models Forecasting models. [Forecasting]	These models estimate the need for additional primary and secondary school places, over the short and long run. They are updated annually when new data becomes available. There are two main models: a) Estimating short term need for places – this model uses data from LAs on current capacity and their own short term projections of pupil numbers to estimate how many more places are needed at LA district level. This model is based on data from local authorities and is updated annually using the School Capacity Survey. b) Estimating long run need for places – this model uses ONS population projections to extend the short term analysis. It projects forward pupils numbers beyond the period that LAs forecast over, by applying trend population growth for school age children, taken from the ONS 'principal' sub national population projections.	The models inform the Department's strategic planning for capital funding during and within spending reviews. There is a financial planning and reputational risk if we significantly under- or over-estimate the need for school places.	A range of quality assurance processes have taken place for these models: i) Separate short and long term models were originally built in Excel and have now been merged and rebuilt from scratch in SPSS (by a separate analyst) and the results replicated. This has provided a high level of assurance that the models are providing consistent results. ii) The Excel versions of the model were methodologically QA'd by another team in the division, familiar with the data.	•	•								•
DfE	Early Intervention Grant (EIG) Allocations Model Spreadsheet based model used for Grant Distribution. [Allocation]	The model calculates the Early Intervention Grant allocations for local authorities. The EIG model is Excel based and uses as its inputs the outputs from: (a) the Sure Start grant allocations model. This Excel based model applies factors such as population, deprivation and scarcity at a local authority level to distribute the grant allocation for spend on children aged 0-4 years old (b) the Connexions grant allocations model. This Excel based model uses a number of factors such as: student population, NEET figures, Non-educational attainment rates, deprivation and area costs adjustments at a local authority level to distribute the Connexions budget for spend on 13-19 year olds. The EIG model combines the outputs from the above two models and applies ceilings and floors to the allocations to minimise year on year changes.	The model is used for allocating a fixed quantum of funding between local authorities. This non-ring fenced grant supports a range of Children, Young People and Family services.	The inputs to the models are updated by the lead analyst. At each stage the inputs are cross-checked for plausibility against data for previous years. Inputs, calculations and outputs are then quality assured by another member of the team. Finally outputs are cross-checked for plausibility by the head of grants management.	•	•		•				•	•	
DfE	CBA/VfM policy appraisal in different areas [Policy Simulation]	Bespoke models are developed whenever some options appraisal is needed to inform policy decisions. The models are used to calculate a net present value for alternative options, or to compare the VfM of various options. They can be simple or sophisticated, depending on the complexity of the issue, and the richness of the evidence. They can be used to inform decisions before they are made; or to justify decisions once made. Each model is created in an Excel file and brings together information and evidence from a variety of sources in a systematic way to set out the costs and benefits of alternative courses of action. A standard discount factor (3.5% pa) is used to discount future costs and benefits to present values. It therefore enables comparisons between options which have very different costs and benefits to be made. Most of the models are in a single Excel workbooks.	Those that are used to inform decisions are business-critical. Those that are used to justify existing decisions are more useful for reducing reputational risk.	Models built by junior economists will be checked or sense-checked by a more senior economist. The level of QAing will depend on the complexity of the model and on the importance of the purpose for which it is used. If the model is to be used for an important decision e.g. the spending review analysis it will be checked by the Chief Economist. If the results from the model are used externally then it will also be checked by the Chief Economist.	•	•			•			•		
DfT	Rail Emission Model (REM). Policy simulation/forecasting/economic model. It was produced by consultants (Transport Research Laboratory), but it is installed, calibrated and run in-house. [Science-Based]	For given user defined years and rail timetables, it produces estimates of rail energy for traction, carbon emissions and associated social costs. It also produces estimates of other rail pollutants (CO, PM10, HC, NOx, SO2) and of the associated social costs.	REM is business critical to the extent that environmental and energy concerns are. REM was used for the recent High Level Output Specification (HLOS). Main (if not only) tool used by government to assess rail environmental impacts. The economic costs of pollution and the financial costs of energy are pretty small compared to other rail cost items. Still, for some rail schemes, rail energy costs are the main driver of the benefit/cost results and hence of the business case.	REM was developed over 3 years by consultants on behalf of DfT. Its first full version was delivered in November 2012. QA processes so far: - developer testing - peer review by DfT officials checking for consistency between inputs and outputs and for the correct working of the model's functionalities - validation by DfT officials of inputs and outputs where appropriate/possible - use of version control and full auditability of inputs/outputs - developer's QA process - dissemination of results to technical and non-technical staff across government - external audit planned to take place in 2013 - inputs sourced from industry, OGDs and within DfT and updated on a regular basis.	•	•	•	•		•		•	•	•
DfT	Rail Carbon Trajectory Model (CTM). Policy simulation/forecasting/economic/financial model. This model is Excel based and was produced in-house. It is run and calibrated in-house. [Science-Based]	It produces estimates of rail energy for traction, carbon emissions (and associated social costs), and energy costs for each future year up to 2050. CTM output and REM's overlap to some extent. The difference is in the level of detail and accuracy of both inputs and outputs - REM is more sophisticated, produces more reliable output at a higher level of detail, but it requires a full specification of a timetable to produce estimates and it takes longer to run.	CTM is business critical to the extent that environmental and energy issues are such for industry. CTM was used for the recent IIP and it is likely to be used for the forthcoming industry SBP.	CTM was developed in-house by DfT. QA processes so far: - developer testing - internal peer review conducted by DfT officials not involved in building the model - validation by DfT officials of inputs and outputs where appropriate/possible - use of version control and full auditability of inputs/outputs - dissemination of results to technical and non-technical staff across government and industry, publication of results - external peer review carried out by a Network Rail official - inputs sourced from industry, OGDs and within DfT and updated on a regular basis.	•	•	•	•					•	
DfT	DfT noise model, Calculation of Railway Noise (CRN) [Science-Based]	Regarded as the national method for calculating noise from railway operations (moving railway vehicles) and is used whenever noise from rail systems needs to be calculated. The method has three elements: 1. The source noise is determined by adding the different contributions from the different rolling stock using a particular length of track. This is achieved through determining the reference level at a fixed distance from the track, that takes account of the total sound energy during a pass by, and then adding those to determine an overall source value. A series of source terms are included in the method for different types of engine and rolling stock. The individual source terms are adjusted to take into account various other factors such as speed and track type. 2. Standard acoustical propagation techniques are used to determine how the sound decays at distances away from the track. That also takes account of features such as the effects of natural and purpose built barriers, and ground cover. 3. Finally, the level at a particular receptor takes account of local reflection effects.	Risk considered low in terms of business plan. As this (noise model) does not drive business critical funding decisions such as HLOS or overall rail budgets. It has been used for HS2 noise assessment and there may be individual schemes where the model is used in terms of mitigation.	The Calculation of Railway Noise (CRN) was published in 1995 by DfT (following the earlier Calculation of Road Traffic Noise in 1988). The CRN has been used, updated, tested and scrutinised both internally and externally – for well over a decade. The CRN model was quality assured at the time. The steps included: - developer model testing, validation, calibration; - quality assurance guidelines and governance arrangements in project initiation document at the time; - internal and external peer review; - high levels of transparency through publication of model methodology and results and by model documentation	•	•	•		•			•	•	•

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DfT	Vehicle Track Interaction Strategic Model (VTISM) (developed by Serco for RSSB and funded through the DfT/RSSB research grant). [Science-Based]	It is specified by the DfT to determine that new trains are sufficiently track friendly to satisfy Network Rail's requirements.	Informs rolling stock procurement.	The model has been subject to developer testing, internal peer review, external peer review, use of version control and QA guidelines.	•	•	•	•		•				
DfT	Structure/Vehicle Gauge modelling such as ClearRoute™ (Balfour Beatty Rail) and PhX rail™ (DGauge Ltd) [Science-Based]	It is used to demonstrate that a train will fit with adequate clearance on the railway routes specified.	Informs rolling stock procurement.	The model has been subject to developer testing, internal peer review, external peer review, use of version control and QA guidelines.	•	•	•	•		•				
DfT	Vehicle dynamics modelling used for both the above models (VAMPIRE) and to determine the Tγ used to calculate part of Variable Track Access Charges [Science-Based]	Calculated the dynamic behaviour of a railway vehicle for use in VTISM and Gauging models noted above.	Informs Variable Track Access Charges.	The model was built by consultants and subject to their own assurance process.	•	•	•	•	•	•				
DfT	Operational and performance models such as RailSys, TRAIL and Vision Oslo all of which are industry standard models approved by Network Rail, but used to assist the development and appraisal of projects and bidders' offers. [Science-Based]	Robustness of timetables, reliability of railways systems and capacity of power supplies against train services.	Used to assist the development and appraisal of projects and bidders' offers.	Use managed and provided by Network Rail.	•	•	•	•	•	•				
DfT	Aircraft Noise CONtour model (ANCON). Science-based model to determine aircraft noise exposure around airports. Owned by the DfT, but developed and maintained by the CAA. [Science-Based].	Calculates noise contours around airports built up from the noise levels of individual aircraft movements, based on the aircraft types, their measured noise levels around airports, route and timing.	This model is used to prepare noise contours for various airports to provide historical trends that are published by the DfT. It is also used to assess future policy options, e.g. impact of new runway, new night noise restrictions etc. It is also used to provide input to the ICAO/CAEP debate on noise stringency.	Model exhibits high levels of QA, extensive embedded version control, high level of transparency of model outputs and changes, and comparison against international models.

Model undergoes external peer review; follows published international best practice guidance; its fitness for purpose over its lifetime is continually reviewed (the model has undergone three major developments over the last 30 years). | • | • | • | • | • | • | • | • | • | • |
| DfT | National Transport Model.

In-house. [Policy simulation] | The NTM is used for forecasting and policy testing. Regular road traffic forecasts are produced for the English road network, with accompanying projections for congestion, journey times and tailpipe emissions. Outputs can be disaggregated in multiple ways. | NTM road traffic forecasts:

- influence the strategic direction of national roads policy;
- provide data for modelling and appraisal of local authority transport schemes; and
- generate DfT's road transport carbon forecasts to inform carbon budget decision. | The National Transport Model (NTM) has been used, updated, tested and scrutinised - internally and externally - for over a decade. The NTM has proportional quality assurance processes in place to ensure that it can be used as a high level strategic transport model. These include:
- External validation of the model;
- Model testing and validation with model updates and development;
- Internal peer review of developments and results;
- Use of version control mechanisms in model updates and development;
- Quality assurance guidelines and governance arrangements defined in project initiation documents;
- Transparency through publication of the models key technical reports and forecast results. | • | • | • | • | | • | | • | • | • |
| DfT | TEMPRO - forecasting model (software package for external users; development previously outsourced but none has been done since 2010) [Forecasting] | Presents trip origin and destination patterns from CTripEnd below. Facility to adjust the trip ends according to more detailed knowledge of demographic data within the zone. | Outputs enable consistent forecasts to calculate VfM to inform funding for major transport schemes. | This is a software package provided to external transport modelling practitioners to enable them to view the NTEM dataset in a more convenient format. The latest version, 6.2, was released in 2009.

The model is widely used for major schemes and transport assessments. Its results are therefore transparent and heavily scrutinised, although since late 2010 we have not had infrastructure in place to maintain or improve it. The existing model was tested by the Department's supplier at that time and independently reviewed by a member of Department staff. | • | • | • | • | | • | | | • | |
| DfT | NTEM dataset suite - forecasting model (software package used internally but some components given to external users on request; mixture of previously outsourced and in-house development). Components are CTripEnd, NATCOP, Scenario Generator, Employment forecaster, Trip Rates regression tool. [Forecasting] | Forecasts of demographic data and trip patterns. Used to ensure consistent assumptions about demand in scheme proposals and avoid bias. Also used as the demand inputs to the National Transport Model. | Outputs enable consistent forecasts to calculate VfM to inform funding for major transport schemes. | This set of tools is used to calculate forecasts of demographic data and trip making used in the National Transport Model (NTM) and provided externally in the National Trip End Model (NTEM) dataset.

The QA for these datasets is focused more on model use than on model development. Generally NTEM datasets are updated not more frequently than once a year. Each time the model is run, the results are checked through a wide variety of automated error-trapping calculations. Results are presented and explained to more senior staff for approval.

In addition to the internal scrutiny, each version of the NTEM dataset is published, and experience suggests that users scrutinise the results heavily. If users identify issues oddities or issues, they can feed these back to the Department either for correction or for future versions of the dataset. This process has already considerably improved the error-trapping calculations (described in the previous paragraph), and the number of issues notified to us on the current version of the NTEM datasets (6.2) is much reduced compared with previous versions. This means that their fitness for purpose is considered every time the models are run. All but one of the modules are given a unique version number when updated. | • | • | • | • | | • | | • | • | • |
| DfT | ERICA - model arranging data for forecasting purposes (software package for external users; development outsourced) [Forecasting] | Builds matrices of trip movements from observed data. | Tool to build forecasting models to calculate VfM for major transport schemes. | This software package is licensed to a wide range of modelling practitioners to assist with an early stage in the modelling process. Licensed users are given a user manual, and the software is provided on the basis that users will check the results. The large number of users provides transparency.

As this software is used at an early stage in the process, there are plenty of opportunities to capture oddities in the results produced from it. Whenever the software package is being used for DfT purposes, there will be an additional level of scrutiny by DfT staff. | • | • | • | • | | • | | | • | |
| DfT | DIADEM - forecasting model (software package for external users; maintenance outsourced) [Forecasting] | Forecasts travel demand taking costs into account. Implements variable demand modelling consistent with SACTRA's 1994 report. | Forecasts to inform VfM for funding of major schemes. | These five packages are licensed to external users to reduce the cost, and improve the consistency, of modelling and appraisal. Each new version is given a unique identifier and tested by the Department's suppliers before release. In addition TUBA, which is the most critical of these packages in establishing the economic benefits of most schemes, had a walk-through of the calculation carried out independently by DfT staff in 2010. | • | • | • | • | | • | | • | • | • |
| DfT | TUBA - value for money model (software package for external users) [Financial Evaluation] | Most calculations for VfM of transport scheme, based on model outputs and Department's WebTAG guidance. | Calculation to inform VfM funding for major transport schemes. | These software packages have been developed over a number of years and maintained in line with the Department's appraisal guidance, WebTAG. The wide user circulation gives a high level of transparency, helping to ensure that issues with each version of the software are identified and resolved. Users are provided with a manual explaining the mathematical calculations and how to use it. Results from the software packages (particularly TUBA) are frequently published on the Highways Agency website. | • | • | • | • | | • | | • | • | • |

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DfT	COBA - value for money model (software package for external users) [Financial Evaluation]	Calculation of accident benefits for VfM of transport scheme, based on Department guidance. Calculation of VfM for smaller schemes.	Calculation to inform VfM funding for major transport schemes.	When the model is used for DfT purposes, the results will be scrutinised by DfT officials, providing an additional opportunity to trap errors or oddities in the software or the way it is used. The calculations and economic parameters used in these tools are set out in the Department's WebTAG guidance. Changes to these calculations and economic parameters are governed by the WebTAG Governance Board, and currently are made on an annual basis. Therefore the fitness for purpose of the calculations undertaken by these software packages is regularly reviewed.	•	•	•	•		•		•	•	•
DfT	QUADRO - value for money model (software package for external users) [Financial Evaluation]	Calculation of construction impacts of traffic in line with Department's guidance, as part of VfM of transport schemes.	Calculation to inform VfM funding for major transport schemes.	The need for all these tools was reviewed in 2011. Following this review, we do not believe COBA, QUADRO and INCA are essential for appraising major schemes and from 1 April 2013 these packages will be withdrawn.	•	•	•	•		•		•	•	•
DfT	INCA - value for money model of travel time reliability (software package for external users). [Financial Evaluation]	Estimation of travel time variability for dual carriageway roads.	Calculation to inform VfM funding for limited number of major transport schemes (although does not affect the numerical VfM).		•	•	•	•		•		•	•	•
DfT	WITA - value for money model (beta version of software package for external users) [Financial Evaluation]	Wider Impacts economic calculations in line with WebTAG Unit 3.5.14.	Calculation to inform VfM funding for major transport schemes (although does not affect the numerical VfM).	This software package has been created for the purpose of reducing the cost of calculating Wider Impact benefits. At present only a version for beta testing is available on request. Should a final version of the software be released, it is expected to have similar quality assurance standards to TUBA described above.	•	•		•		•		•	•	
DfT	WebTAG spreadsheets - value for money models developed internally for external users. [Financial Evaluation]	Post processing of model outputs to calculate impacts of noise, air quality, greenhouse gases. Calculation of marginal external costs of increasing highway traffic.	Calculation to inform VfM funding for major transport schemes.	These are simple models used to calculate some environmental and economic impacts, available on the WebTAG (Web Transport Analysis Guidance) website. In recent years, the quality assurance procedures for updates have improved with internal review taking place before the spreadsheets are released. Their wide availability means that they can also be checked by many external users. Updates are governed by the WebTAG Governance Board.		•						•	•	
DfT	Various - transport models developed by Local Authorities to support application for funding from DfT Forecasting models whose outputs include: traffic flows, public transport use, revenues, appraisal information (e.g. value of time savings, CO2) Models are run by, or on behalf, of Local Authorities. [Policy Simulation]	Forecasts journey times and traffic/public transport use under different future scenarios, principally with/without investment. The key outputs inform the appraisal of transport schemes and include changes in journey time, traffic, public transport use, revenues, fuel use, CO2 etc.	Drives funding decisions which form part of Business Plan priorities	Individual scheme models have been developed by Local Authorities to support schemes in the Local Major Scheme Programme. The following quality assurance processes are in place for model development: · Peer review of proposed methods through DfT having an early engagement process; · Version control and internal peer review/audit is used by Local Authorities (these processes are not scrutinised by the DfT); · Independent audit through the DfT scrutiny of model data, validation, forecasting and appraisal; · A separate division within DfT reviews the overall assessment; · High levels of transparency through Local Authorities publishing Business Cases and supporting model documentation on their website.	•	•	•	•	•	•		•	•	•
DfT	National Bus Model (NBM) - Policy simulation model. Developed by MVA consultancy, model to be maintained and run in-house [Policy Simulation]	Estimates the VfM of various bus subsidy policy options, e.g. BSOG. Key outputs are passenger trips, bus fares, bus kms and impact on wider welfare benefits. Internal department model, which is not publicly available. Calculates for a 15 year period.	Provides evidence base for bus subsidy policy reforms. VFM supports the justification for the policy - it may influence the way in which funding is spent in the future, e.g. moving from BSOG* to per passenger incentive system (changing distribution mechanisms) *BSOG is a bus service operator grant that is provided directly to bus operators. The subsidy is linked to fuel consumption and is currently provided at a rate of 34.57 pence per litre of fuel consumed	The National Bus Model has been through developer testing, internal peer review and uses of version control. The outputs have been sense-checked against published research and a previous model. A user manual has been produced.	•	•	•	•		•	•			•
DfT	Forecasting Model for drive test demand [Forecasting]	Provides statitical forecasts of demand for the driving test (car, motorcycle, vocational etc) - theory and practical.	Feeds into DSA's Business Planning process and its quarterly revisions. This affects budgeting decisions - e.g. influences the number of driving examiners recruited.	The Quarterly Forecasting Model has been used, updated and tested by IHAC and by DSA - for over seven years. It is runs on a quarterly basis and the output is fully discussed with the DSA either in a face-to-face meeting (DSA/IHAC) or telephone/video conference. It is regularly reviewed, this includes: - developer model testing, validation, calibration and backcasting; - use of version control mechanisms;; - user review of output; - methodology based standard approaches and tested against sample data; - two external review of regression approach in the last seven years.	•	•	•	•						•
DfT	DfT Basic Local Authority Carbon and Air Pollutants tool. [Science-Based]	Provides guidance on carbon and air pollutants modelling in transport, and links to data sources/research documents that can assist local authorities in doing this. Calculates carbon and air pollutants emissions changes between pre and post intervention .	Supports the Green and Localism agendas - providing LAs with a consistent means of evaluating the carbon impact of their transport decisions.	The first version of the Carbon tool was developed during 2010/11 and published on the DfT website for consultation in February 2011. Since then, the tool has been used by local authorities to calculate carbon emission savings. The tool was further developed in 2012, and will be published on the DfT wesbite early 2013. Both versions went through a rigorous QA process. This process include: - thorough documentation of methodology and tool structure; - detailed user guide to ensure that the tool is used appropriately; - tools were developed alongside guidance from local authorities and internal and external stakeholders; - thorough documentation of data updates schedule; - tool methodology and outputs were validated against published data; - use of version control mechanisms - tool will be reviewd and data will be updated annually.	•	•	•	•					•	•
DfT	Resource planning model for driving examiners. Excel spreadsheet. [Planning]	Calculates level of driving examiner resource required to deliver all types of practical driving test and support activities.	Feeds into DSA's Business Planning process. This affects budgeting and planning decisions - e.g. influences the number of driving examiners recruited, amount of support activites to undertake.	The Resource Planning Model has been used, updated and tested by IHAC and by DSA - for over eight years. It is run on a monthly basis and the output feeds into DSA's business planning process. It is regularly reviewed, this includes: - use of version control mechanisms; - user review of output following monthly update; - yearly user reviews for fitness for purpose; - developer model testing, validation and calibration; - user review of outputs following all model developments.	•	•		•						•
DfT	MCA Coastguard Simulation Model. [Policy Simulation]	Uses Monte Carlo simulation to simulate the management of Search & Rescure operations by the Coastguard and the impact of various resourcing scenarios to be modelled.	Supports operational business decisions about resourcing levels.	The Coastguard Simulation Model was developed over the past six months in close collaboration with the MCA. It will be used over the next two months to explore staffing levels in the Future Coastguard Programme. The quality assurance processes were recently reviewed by an external analyst and found to be adequate; they include: - developer model testing and validation against historic data; - developer testing with dummy data; - a sense check of outputs involving stakeholders from the MCA; - sensitivity testing of inputs; - a detailed review of code by another IHAC analyst; and - thorough documentation of code and methodology.	•	•		•	•					•

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DfT	Aviation Model In-house [Forecasting]	Forecasting and Policy Simulation The model produces forecasts of air passenger demand, flights and CO2 emissions. It can also be used to estimate some of the key costs and benefits of airport policy options.	Business plan priorities and reputation risks. The model is likely to be used to support the Independent Airport Commission - the model could inform the Commission's recommendations and potentially Government policy regarding airport capacity options. It also informs other DfT aviation policies e.g. on EU-ETS and CO2 emissions, airport regulation and competition and has been used by OGDs including HMRC.	The aviation model has been used, updated, tested and scrutinised - internally and externally - for over a decade and successfully withstood Judicial Reviews. The aviation model has good quality assurance processes in place. These include: - developer model testing, validation, calibration and backcasting; - extensive use of version control mechanisms; - quality assurance guidelines and governance arrangements defined in project initiation documents; - internal and external peer review; - high levels of transparency through publication of model methodology and results and by thorough model documentation; and - up-to-date assessment of the models fitness for purpose by independent experts.	•	•	•	•		•	•	•	•	•
DfT	Network Modelling Framework (NMF) - Forecasting and Planning Models - In-House. [Forecasting]	Models the demand and VfM implications of rail initiatives. Uses capacity and train timetable information coupled with exogenous factors such as fares, GDP, population and other changes, to forecast future rail demand and to assign this demand to train services. Analyses crowding and demand impact, estimates BCR of options. Main outputs are load factors, demand forecasts, BCR based on WebTAG guidance.	Drives HLOS funding and investment decisions - essential to supporting DfT legal requirement to publish its five-yearly statement of outputs and spend, and to provide directions to the industry on future investment decisions, risk of reputational damage.	The NMF has been used, updated, tested and scrutinised for over five years. Some of the components have been developed, used and tested by the whole of the rail industry (MOIRA), and further tested in-house as part of user acceptance testing, validation and calibration work. The NMF has good quality assurance processes in place. These include: - developer model testing, validation and calibration; - extensive use of version control mechanisms; - quality assurance guidelines and governance arrangements defined in project initiation documents; - internal and external peer review, including formal audits of the model; and - high levels of transparency through publication of model architecture, functionality and methodology thorough detailed user and technical documentation.	•	•	•	•	•	•	•	•	•	•
DfT	MOIRA rail model - rail demand forecasting, planning models, train-operator specific versions supporting franchises, both in-house and contracted, and held and used by third parties. A new version of the model is being developed jointly between DfT and the association of train operating companies (ATOC) - called MOIRA2, which is an enhanced version of MOIRA2, as it incorporates new functionality such as modelling crowding on trains and by time of day, and modelling of differential fares. [Science-Based]	Models timetable (rolling stock and timetable) changes and assigns demand to the rail network. Main outputs are rail demand by time of day and by service categories. MOIRA2 will additionally output crowding impacts, and will also be able to produce some appraisal outputs to inform BCRs of rail options.	Used to analyse demand at a more detail level than NMF, and informs capacity enhancements better when implementing HLOS. Drives negotiation between TOCs and DfT on capacity investments. Has some financial risk associated with getting it wrong.	MOIRA is an industry best practice tool, developed, updated, tested and scrutinised for over two decades. A new version of the model has been developed and thoroughly tested, and is currently being enhanced following user recommendations. The model has good quality assurance processes in place. These include: - developer model testing, validation and calibration; - extensive use of version control mechanisms; - quality assurance guidelines and governance arrangements defined in project initiation documents; and - internal (industry, including the Department) peer review. Model documentation including detailed functional specification, is available to the user community, and is transparent. There has been no formal external audit of the model, but the industry review and use is deemed sufficient to ensure model fitness for purpose and quality assurance.	•	•	•	•		•		•	•	•
DfT	EDGE (Exogenous Demand Growth Estimation) - Rail Demand Forecasting Tool - internal. [Science-Based]	EDGE forecasts rail demand using exogenous inputs such as population, GDP, employment, car availability and cost, air cost, etc. It includes PDFH recommended fares and other elasticities, and incorporates WebTAG guidance on other values. Main output is rail demand forecast for future years by each model zone.	Demand forecasts are integral to advice which affects investment plans and funding requirements. Lack of rigour will impact on VfM of rail schemes and may lead to wrong prioritisation of investments with reputational and financial risks.	EDGE has been built as a replacement to RIFF-Lite (which was an Excel based model). It has been used extensively internally, and also forms part of HS2 suite of forecasting tool. The model has also been externally audited and was deemed appropriate to replace RIFF-Lite. Although being a new model which now forms part of NMF, it has good quality assurance processes in place. These include: - developer model testing and validation (model outputs compare well with parallel models); - extensive use of version control mechanisms; - quality assurance guidelines and governance arrangements defined in project initiation documents; - internal and external (for work conducted by third parties) peer review; and - good documentation which DfT intend to publish soon.	•	•	•	•		•	•	•	•	•
DfT	PLANET Suite of Models (Planning Networks) - rail demand forecasting, planning models. Outsourced to a pre-selected group of consultants who have expertise in running and maintaining the model on behalf of DfT [Forecasting]	Model contains less commercially sensitive information relating to train operators, and is easier to use when detailed rail timetables do not exist. The main outputs are demand forecasts and assignment of such demand to train services on the whole GB rail network. Does not produce BCRs, but only demand and load factor information for further use.	Some projects such as Thameslink have used PLANET South which is part of the suite. These have implications on the VfM of the project or the development of options tested in the model. HS2 are also using a version of PLANET which they are now enhancing following previous problems with the model parameters etc.Large financial and reputational risks.	The PLANET Suite contains a number of regional models, and a strategic version (which has been enhanced and developed further for HS2 purposes). The model has been used, updated, tested and scrutinised for over 15 years; with a strong structure for internal peer review within the PLANET procurement framework. The suite has good quality assurance processes in place. These include: - developer model testing, validation (model outputs compare well with parallel models) and calibration; - extensive use of version control mechanisms; - quality assurance guidelines and governance arrangements defined in project initiation documents; - internal and external (for work conducted by third parties) peer review; - medium level transparency through publication of technical and user documentation.	•	•	•	•		•				•
DfT	Strategic Fares Model (SFM) - Revenue Forecasting Model, Planning Model, in-house. [Policy Simulation]	SFM uses detailed revenue data for all rail fares, combines them with PDFH and other estimated elasticities, to forecast the impact of changes in fares cap. The outputs are changes in demand and revenue by train operating company.	The decision to set the cap for fares regulation impacts on the revenue lines for train operators, and hence impacts on DfT funding of franchises. It also informs its spending revenue decisions.	SFM is a strategic model which allows confidential industry revenue and demand data to be manipulated for the purpose of analysing policy options regarding fares regulation. The model was built in 2003, formally audited and found fit for purpose. It has been updated extensively, and further updates are currently being implemented. The model is used extensively, validated against actual data and parallel model outputs; use extensive version control mechanisms and is regularly reviewed (internally) especially when updates are made to the model (and externally reviewed by consultants when supporting negotiation with train operating companied). The methodology has been shared with industry parties, but not published. Detailed outputs of the model are not published for reasons of commercial confidentiality. The QA processes in place are sufficient to ensure fitness for purpose.	•	•	•	•		•	•			•
DfT	Comparator/Business case model for each franchise - outsourced to Technical Advisors (TAs). Each franchise has a separate model, but they are all similar and cover the same things. [Financial Evaluation]	Calculates the vfm of the franchise, including TOC revenues, costs, franchise premium and BCRs when applicable.	High profile, essential for franchise assessment.	Technical advisors for each rail franchise competition create a franchise specific comparator and business case model. Model inputs and assumptions are agreed with the Department and are compliant with the relevant guidance. The comparator model relies on industry standard models already tested (eg EDGE) and uses industry standard practice set out in the Passenger Demand Forecasting Handbook. Quality assurance processes followed include: Developer testing. Internal and external peer review. Use of version control. Appropriate governance. Quality assurance guidelines.	•	•	•	•		•		•		
DfT	GDP model - Risk model for individual franchises. [Planning]	Models risk to DFT budgets from changes to GDP and emplotyment and the impact of different risk transfer mechansims. Used for calculating the Subordinated Loan Facility in the ICWC, Great Western and Essex Thameside franchises.	Risk modelling is required by HMT for each franchise ITT approval. Is embedded in the bid evaluation process for Great Western and Essex Thameside. Critical status depends on the suspension of these competitions being lifted. If the current competitions are cancelled and a new risk transfer proposition used in a new franchise competition then model is no longer business critical.	The model was developed internally as a risk assessment tool for risk sharing mechanisms in rail franchise contracts. Development was subject to version control and internal review processes. The model was additionally used to test financial robustness as part of the franchise bid evaluation process. This model is live in only the franchise competitions halted in October 2012 and its future use depends upon the status of those competitions.		•		•						

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DfT	PLANET Framework Model, forecasting model, outsourced. Part of the PLANET suite. Outsourced, and twice re-tendered, to consultants who have expertise in running, improving and maintaining the model. [Science-Based]	A passenger demand modelling framework for the assessment of the HS2 proposal, including demand inputs needed for value for money (VFM) appraisal, option development & routing. Outputs include passenger numbers, revenues, time savings, over crowding impacts, highway decongestion impacts.	High profile. VFM necessary input to policy decisions and the forthcoming hybrid bill and public consultations. Demand forecasts important to determine route and service specification.	HS2 Ltd has applied a comprehensive range of QA processes since 2009: - external model development and analysis follows QA industry accredited processes and DfTguidance (WebTAG); - over 400 staff days of internal QA; - over 600 days of external QA by: other contractors and HS2Ltd's technical experts - further external QA by an independent Analytical Challenge Panel, other government departments and the National Audit Office; - over 800 days external audit of model coding; high level of transparency with forecasts and documentation published. These have been reviewed in detail by the public, HS2 campaign groups and their expert advisers; and, - model development and analysis subject to specified governance arrangements.	•	•	•	•		•		•	•	•
DfT	Estimating model for capital cost of construction of HS2. [Forecasting]	The model has been purpose built for HS2 Ltd. It takes quantities as provided by the design consultants and mutliplies these by a set of construction unit rates. The key output is an estimate of the construction cost of the routes for HS2. It is not publicly available.	The model has been used to estimate the capital cost of construction for the proposed HS2 route.	The cost & risk model has been supplied by Davis Langdon who were appointed for Cost & Risk services. The model is a modified version of a standard estimating model based in Excel. This has been rigorously tested and the outputs checked in line with Davis Langdon's QA procedures. The rates within the model have been peer reviewed and checked. The quantities in the model have been provided by the design consultants who have their own QA process and are then checked by HS2 route engineers.	•	•		•		•			•	
DfT	Crossrail Business Case appraisal spreadsheet. [Financial Evaluation]	Calculates Cost Benefit Ratio and farebox revenue. Inputs are taken from other TfL owned models (e.g LTS, Railplan, Crossrail Operating Cost Model). Inputs also taken from CRL Central section Maintenance model.	Provides value for money basis for investment in Crossrail.	The Crossrail Business Case model has been used, updated, tested and scrutinised (internally and externally) for around 10 years. The Crossrail Business Case model has the following assurance processes in place. These include: · Developer model testing; · Extensive use of version control; · Internal and external peer review; · High levels of transparency through the publication of the Crossrail Business Case at various stages in the projects development and subsequent construction, as well as method statements explaining the benefit calculations methodology.	•	•	•	•					•	
DfT	Crossrail Investment Model. [Financial Evaluation]	Calcuates project outturn Anticipated Final Cost for project. Estimate of Risk taken from a Quantified Risk Assessment (QRA) undertaken by CRL.	Provides costs estimates and risk assessment for Crossrail.	The Crossrail Investment Model has been used, updated tested and scrutinised (internally and externally) for around 5 years. The Crossrail Investment model has the following assurance processes in place. These include: · Developer model testing; · Extensive use of version control; · Internal check functions embedded within the model; · Internal and external peer review (CRL Board approval is required before model is released to either project Sponsor (DfT or TfL); · Annual external audit by independent experts; · Model documentation.	•	•	•	•			•		•	•
DfT	Office of Low Emission Vehicles programme business case model. VfM model [Policy Simulation]	The model estimates the costs and benefits to society of policy interventions to increase the uptake of ultra-low emission vehicles. The model includes the policy costs of the OLEV programme, covering the plug-in car grant, the plug-in van grant.	High profile policy initiative at the time. Used to justify spend in Spending Review 2010.	The OLEV programme Business Case model has been developed and used since 2010, providing outputs closely scrutinised through the Spending Review process. The model is updated annually, incorporating the latest evidence on this emerging market. The model has good quality, proportionate assurance processes in place, including: - developer model testing and validation; - extensive use of version control mechanisms; - quality assurance guidelines and governance arrangements developed in consultation with policy colleagues; - internal model peer review and external peer review of model outputs; - up-to-date assessment and development of the model's fitness to take account of changing market circumstances.	•	•	•	•				•		
DfT	The OLEV Plug-in Car Grant and Plug-in Van Grant. Estimate level necessary of grant. [Policy Simulation]	The model estimates the amount of grant that is required is to incentivise the purchase of ULE vans and cars by comparing the total cost of ownership of a ULEV with a conventional alternative.	High profile policy initiative at the time. The grant offer is a public figure which is critical to determine both the value for money of the consumer incentive scheme as well as encouraging ULEV uptake.	The OLEV Plug-in Car Grant and Plug-in Van Grant models are updated annually, incorporating the latest evidence on this emerging market. The model has good quality, proportionate assurance processes in place, including: - developer model testing and validation; - extensive use of version control mechanisms; - quality assurance guidelines and governance arrangements developed in consultation with policy colleagues; - internal model peer review and external peer review of model outputs, including EU Commission; - transparency of results as Grant levels are in public domain; - up-to-date assessment and development of the model's fitness to take account of changing market circumstances.	•	•	•	•		•		•	•	•
DfT	Car & Van Fleet Forecasting Models. Forecast car and can fleet fuel efficiency. [Science-Based]	The model estimates the fleet fuel efficiency of cars and vans to 2050 and 2035 respectively. This output is used in the NTM as well as OGD models. It outputs a series of car and van fleet fuel efficiency in l/km and gCO2/km.	The model outputs are published as part of DfT's online appraisal guidance (WebTAG) so is an input into a range of other models.	The Car and Van fleet models are updated annually, incorporating the latest evidence on trends in the vehicle market. The model has good quality, proportionate assurance processes in place, including: - developer model testing and validation, and calibration to the National Transport Model; - extensive use of version control mechanisms; - internal model peer review and external peer review of model inputs and outputs; - quality assurance governance through DfT in consultation with analytical colleagues; - transparency of results through publication in Transport Appraisal Guidance; - up-to-date assessment and development of the model's fitness to take account of changing market circumstances.	•	•	•	•		•		•	•	•
DfT	Fuel Price Forecasting Model. [Forecasting]	Produces forecasts to 2050 of pump prices of transport fuels, from DECC forecasts of crude oil prices and assumptions about other costs	The model outputs are published as part of DfT's online appraisal guidance (WebTAG) so is an input into a range of other models.	The fuel price forecasting spreadsheet model is relatively simplistic, transforming DECC oil price projections and historic cost information into motor fuel price projections. Quality assurance processes consist of: - Sense checks and comparisons with previous results during development. - Logging changes in a version control system. - Reviews of the model inputs and outputs by DECC (the main customer). - Internal review, in particular by the incoming Assistant Economist during annual rotations. - The publication of the outputs as parts of DECC publications and DfT guidance.	•	•	•	•					•	•
DfT	Roads Feasibility Study Financial Model for financial evaluation (in-house spreadsheet model). [Policy Simulation]	The Roads Feasibility Study Financial Model is a policy simulation model used for exploring the relative value for money of different ownership and financing models for the national roads system, and the funding that would be required to support them.	High profile policy initiative at the time. Outcome of VfM analysis will form an important part of the advice regarding the ownership and financing of the Strategic Road Network.	This model has been developed by an external contractor and reviewed and extended by DfT staff. Internal checks, such as an alternative means of checking key results, are embedded into the model. Infrastructure UK at HM Treasury undertook a review of the model's function and structure. Documented version control is embedded in the model and the file naming convention, and a change log is included. External peer review has been completed by KPMG.	•	•	•	•					•	•

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DfT	Thameslink Rolling Stock Project (TRSP). Whole Life Cost Model prepared by PricewaterhouseCoopers (PwC). [Procurement & Commercial]	The model calculates the costs over 30 years of the leasing and operation of the new fleet of trains and the leasing of the two new maintenance depots. The model calculates the costs of: - Train Leasing Costs. - Train Maintenance Costs. - Depot Leasing Costs. - Energy Consumption. - VTISM Costs (VTISM software links track and vehicle characteristics and asset management strategies to outputs such as track component life and infrastructure costs). - Performance Adjustments (representing the costs arising from the number of delay minutes expected to arise as a result of technical faults during the operation of the trains). - Programme (representing the costs associated with a delay in introducing the new trains). - Miscellaneous Items (any one-off costs identified by bidders, including break costs in relation to the inability to complete the build of the full fleet).	The TRSP tender evaluation process was a four stage process culminating in the identification of the Preferred Bidder on the basis of the bid which, after having met the minimum requirements of evaluation stages 1 - 3, had the lowest NPV whole life cost. The model's effectiveness thus has possible financial, legal and reputational risks.	The model has been developed by the Department's appointed financial advisors, PwC, and has been subject to PwC's extensive internal assurance processes that cover a range of quality assurance processes.	●	●	●	●	●	●		●	●	●
DfT	Thameslink Programme Business Case model. An appraisal model suite (consisting of many sub-models e.g. the PLANET South V4 Model for passenger demand, crowding, etc) developed and run by Atkins Rail. [Procurement & Commercial]	Determines BCR of overall Thameslink Programme including rolling stock. Determines the demand response of the Thameslink Programme.	The outputs of the model are a factor in informing the Department's decisions around progressing with the Thameslink Programme including the rolling stock procurement. The outputs of the model thus have possible financial, legal and reputational risks.	Atkins have utilised their own QA process in constructing/operating the Model. The outputs of the Model are scrutinised by DfT Economists and TASM as part of the overall business case assessments.	●	●	●	●	●	●				●
DfT	Rail Refranchising: Financial Model Templates. [Financial Evaluation]	Formulae are mostly subtotals/totals/NPVs which generate the key summary outputs, e.g. revenues, costs, premiums.	Forms the basis of financials for full length of a franchise. Needs to be clear enough to make comparisons between Bidders (who have each populated the templates). Will be picked up again if there is an event of Change in the franchise.	Templates are developed and internally reviewed by our technical advisors. Templates also issued to Bidders in advance who identify errors/inconsistencies. Once models are populated by Bidders they are certified by another external organisation as being correct.	●	●	●	●		●	●		●	●
DfT	Lower Thames Crossing - Financial Business Case - in house. [Financial Evaluation]	Internal department model for generating FBC values.	Drives key funding decisions and essential to the achievement of business plan priorities.	Developer testing, Peer review, version control and detailed internal review.	●	●		●	●					
DfT	DfT – Government Shared Services Procurement – Cost Calculator. [Procurement & Commercial]	Model will be internal to DfT / Cabinet Office only and will be based on Unit Pricing Submissions made by the three bidders. The Cost Calculator then determines the weighted average cost scores for each bidder using three different volumetric scenarios.	Costs represent 40% of the ISFT score. It is likely that costs will be a key differentiator in deciding which of the three well qualified bidders is awarded the contract.	Internal DfT review; assurance review from Financial Advisers; additional review by Cabinet Office person (not currently involved in the procurement).	●	●	●	●	●	●				
DfT	DfT – Government Shared Services Procurement – Economist Case Model. [Procurement & Commercial]	Model will be internal to DfT and will inform the decision as to whether or not DfT should continue with / conclude the procurement with the proposed preferred bidder .	The purpose of this model is to quantify the relative costs in Net Present Value terms of the main options available to DfT at the three stages of the Business Case.	Internal DfT review; assurance review from Financial Advisers; additional review to be carried out by a Cabinet Office person (not currently involved in the procurement).	●	●	●	●	●	●				●
DfT	Simple bidders cost model developed by PricewaterhouseCoopers. [Procurement & Commercial]	Historically extensively used by the Department in assessing annual and NPV cost of each bidders proposal and feeding into Business case evaluation. A version of this model is likely to be used in future in determining whether or not to go ahead with the follow on order for East Coast Phase 2.	The model informed the Department's decision to go ahead with Agility Trains in the IEP procurement in March 2011 and to enter into a contract with Agility in July 2012. The model's effectiveness thus has possible financial, legal and reputational risks.	The model has been subject to internal review by PwC in addition to PwC's own quality assurance processes. PwC has provided the DfT with a letter that summarises its model QA procedures and in particular those in respect of IEP.	●	●	●	●	●	●		●	●	●
DfT	Appraisal modelling suite (consisting of passenger demand, crowding and revenue model, operating cost model, SAP and risk and adjustments model and appraisal model) developed by Steer Davies Gleave (SDG). [Planning]	Passenger Demand, Crowding and Revenue model: forecasts the level of demand and revenue (including the impact of crowding) given underlying demand growth forecasts, train service specifications and PDFH guided input assumptions. The model also provides information on costs and benefits, in line with the Department's webtag guidance.	Outputs from the model informed the Department's decision to sign the IEP contracts in July 2012. The model's effectiveness thus has possible financial, legal and reputational risks.	The models which comprise the appraisal modelling suite have been subject to internal review by SDG. A description of the demand and crowding model and the appraisal model was submitted for assessment by the PAR Review of IEP (February 2012).	●	●	●	●	●	●		●	●	●
DfT	Long Term Forecast of Rail Finance. [Forecasting]	Forecasts long term income and expenditure of rail for the department with particular regard to the train operating companies and network rail grant.	Drives key funding appraisal - crucial to departmental budgeting and forecasting - provides comparators to assess commercial bids for rail franchises. Rail franchises carry substantial financial risk.	The LTF started several years ago and has developed significantly since. Although the outputs of the model are highly commercially sensitive, during that time it has been subject to review through: • Expert review of forecasting and the model. • Periodic internal reviews of its methodology, structure and accuracy. • Comparison against the outputs of internal economic forecasts. • Comparison against equivalent forecasts by independent third parties. • Development of a new model which replicates the outputs of the old model. This model verified the methodology and accuracy of the current model. • Imminent review by internal audit.	●	●	●	●					●	●
DfT	Search and Rescue Helicopter "Vicinity Model", bidder submission evaluation model, in-house. [Procurement & Commercial]	The SAR vicinity model is used by DfT and bidders to verify that helicopters flying from specific base locations can reach areas of the UK SAR region, and within certain timeframes. Bidders input proposed base locations, and helicopter ranges and speeds, into the model to demonstrate to DfT that they are able to meet the key user requirements specified in the procurement documentation.	Very high value procurement. Model informs key (pass/fail) user requirements. Establishing a workable basing strategy is an essential part of procuring the new SAR service. The successful delivery and implementation of this is business plan critical.	The Vicinity Model was originally developed in MoD then transferred to DfT. At MoD: a review of the input data; advice from experts on assumptions/calculations; an external assurance review by Atkins of the model and the decision to close two bases. At DfT: a review of the spreadsheet workings by the receiving analyst; a second review by a non-analytical team member; full documentation and user instructions written; Frazer-Nash Consultancy spent 1½ days checking the calculations and developing an independent version for comparison; a more in-depth review (5 days) by the In-house Analytical Consultancy (IHAC) of the spreadsheet workings and documentation.	●	●	●	●			●	●	●	●

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DfT	Search and Rescue Helicopter 'Cost Model' consists of two spreadsheets: Cost Input Model template spreadsheet. This is a template model sent to all Bidders into which each Bidder entered their cost and some input assumptions. Cost Model template spreadsheet. This was a template model sent to all Bidders, which when linked to the completed Cost Input Model Template Spreadsheet, calculates the Prices to be paid by the Department and is used to assess value for money and affordability. Once the Cost Input spreadsheet has been completed, it becomes the Bidder's Cost Inputs Model and the Cost Model becomes the Bidder's Cost Model and the DfT instructions to Bidders have been clear that once the templates are populated with Bidder data, the Models are the Bidders' responsibility. [Procurement & Commercial]	The Cost Input Model includes detailed cost breakdowns of the bidders' proposals on a base by base basis. The Cost Model calculates the Total Nominal Contract Charge, which represents the overall price to DfT, and is used to assess the NPV and affordability of each bid.	The Bidder Cost Input Models contain for each Bidder detailed breakdowns of their cost base. The Bidder Cost Models calculate the prices which will be inputted into the Payment Mechanism at contract signature and will therefore drive the final amount the Department pays for the UK SAR service.	UK SAR financial model is based on a Cost Model that was used in an earlier SAR helicopters contract procurement. An overview of the key purposes and main features of the model was provided to KPMG at the outset. Model was developed by experienced KPMG personnel using best financial modelling practice. Regular reviews of the model under development and at finalisation were done by KPMG accredited staff using specialist MRT model audit software. DfT and MCA have undertaken independent reviews. Bidders were briefed on the model and encouraged to explore it themselves prior to completion of initial submissions.	●	●	●	●	●	●	●	●	●	●
DfT	Range Estimating Tool - commercial model - outsourced. [Financial Evaluation]	Three Point Estimates are produced for the various components of an estimate and combined using a statistical model to provide a realistic representation of the range of possible outturn costs, i.e. plausible minimum, plausible maximum and most likely.	High profile policy initiative following criticism of the Nichols review - use mandated by SoS. Allows uncertainty in construction programme to be properly considered, thereby influencing budget setting for roads programme.	This model was built by consultants and has been subject to developer testing, internal peer review and the use of version control and of internal QA guidelines. There is governance structure in place to manage both model development and review.	●	●	●	●		●		●		
DfT	Traffic models are used to forecast the impacts of Local Network Management Schemes (LNMSs). Type of model varies according to scheme requirements but could include, all or nothing, assignment, junction, micro simulation. Scope of modelling proportionate to scheme cost, complexity and significance of impacts. Outsourced [Science-Based]	Model the effect of the scheme on traffic flows and speeds for input to the Project Appraisal Report (PAR) which provides economic, social and environmental assessments plus a value management score.	Provides basis for value management of HA's small scheme programme. Identifies infringements of environmental legislation	The traffic models used to support the HA's schemes are based on proprietary software that has been widely used in the industry for very many years. The software is subject to review and update by the software developers in response to technical developments and user comments. The utilisation of the proprietary software to build individual scheme models is subject to good quality assurance processes. These include: 1 - continuous review of the model building by a reviewer independent of the model builders and the scheme team; 2 - consideration of model application and proportionality at inception of model building; 3 - version control by the model builders; 4 - internal checks and reviews by the consultants building the model; 5 - a requirement to follow guidance recognised as representing best practice; 6 - specified minimum calibration and validation standards;	●	●	●	●		●	●	●	●	●
DfT	Traffic models are used to forecast the impacts of Local Network Management Schemes (LNMSs). Type of model varies according to scheme requirements but could include, all or nothing, assignment, junction, micro simulation. Scope of modelling proportionate to scheme cost, complexity and significance of impacts. Outsourced. [Science-Based]	Model the effect of the scheme on traffic flows and speeds for input to the Project Appraisal Report (PAR) which provides economic, social and environmental assessments plus a value management score.	Provides basis for value management of HA's small scheme programme. Identifies infringements of environmental legislation.	7 - quality assurance guidelines and governance arrangements defined in contract documents; 8 - scrutiny of the model quality, e.g. validation, its forecasts and the results of its application by a Highways Agency appraisal certification officer who is independent of the model builders and scheme team; 9 - preparation of the value for money assessment requires DfT officials to undertake a high level sense check of scheme assessments; 10 - model quality, forecasts and the results of its application are included as evidence when a scheme is subject to a public inquiry when the evidence is subject to scrutiny and challenge; 11 - high levels of transparency through publication of model methodology and results and by thorough model documentation; and 12 - a comprehensive evaluation programme consisting of comparing the model forecasts with the actual outturns of projects.	●	●	●	●		●	●	●	●	●
DfT	Variable demand and assignment traffic models used to forecast the impacts of HA major schemes. Outsourced. [Science-Based]	Model the effect of highway improvement schemes on traffic flows and speeds. Provides forecast flows and speeds for use in economic, social and environmental assessments.	Provides basis for VFM decisions and inputs to other models used to demonstrate compliance with environmental legislative requirements.		●	●	●	●		●	●	●		
DfT	PRISM: Variable demand and assignment traffic model used to forecast the impacts of HA major schemes, West Midlands Metropolitan Authorities transport proposals and the effect of planning developments. [Science-Based]	Model the effect of transport improvement schemes on transport movements. Provides forecasts for use in economic, social and environmental assessments.	Provides basis for VFM decisions and inputs to other models used to demonstrate compliance with environmental legislative requirements.		●	●	●	●		●	●	●	●	●
DfT	Greater Manchester Models: Variable demand and assignment traffic models used to forecast the impacts of HA major schemes, Greater Manchester transport proposals and the effect of planning developments ; Outsourced for HA. [Science-Based]	Model the effect of transport improvement schemes on transport movements. Provides forecasts for use in economic, social and environmental assessments.	Provides basis for VFM decisions and inputs to other models used to demonstrate compliance with environmental legislative requirements.		●	●	●	●		●	●	●	●	●
DfT	Detailed Air quality dispersion modelling - produced - external organisations / use to support scheme assessments -- outsourced. [Science-Based]	Model calculates air quality concentrations for comparison with legal UK Air Quality Thresholds.	Information used to determine the significance of scheme impacts and whether a scheme needs an EIA or not. Where an EIA is required the scheme is referred to the planning inspectorate and adds up to 2 years to the programme.	Limited information on the production of model equations due to commercial restrictions, version control, external QA process to support scheme assessments.	●	●	●	●		●		●	●	
DfT	Noise modelling - produced - external organisations / use to support scheme assessments -- outsourced. [Science-Based]	Model calculates Noise impacts for comparison with legal UK Thresholds.	Information used to determine the significance of scheme impacts and whether a scheme needs an EIA or not. Where an EIA is required the scheme is referred to the planning inspectorate and adds up to 2 years to the programme.	The noise models used to support the HA's schemes are based on proprietary software that has been widely used in the industry for many years. The software is subject to review and update by the software developers in response to technical developments and user comments. This includes updates to the UK noise calculation methodology - 'Calculation of Road Traffic Noise' - which is incorporated into the software and relevant updates to the assessment methodology set out in Design Manual for Roads and Bridges, Volume 11, Section 7, Chapter 3. The utilisation of the proprietary software to build individual scheme noise models is subject to good quality assurance processes. These include: - version control by the model builders; - validation of model at development stage using 'real world' data; - internal checks and reviews by the consultants building the model; - a requirement to follow guidance recognised as representing best practice (DMRB 11.3.7); - specified minimum validation standards; - quality assurance guidelines and governance arrangements defined within contract documents; - high levels of transparency through publication of model methodology and results and by thorough model documentation; and - Post Opening Project Evaluation (POPE) comparing forecast project environmental outcomes and actual project outcomes.	●	●	●	●		●		●	●	

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DfT	Water quality assessment - At the feasibility stage, the impact is assessed using the DfT WebTag in the same way as for Noise and Air Quality. However at detail design stage Highways Agency Water Risk Assessment Tool (HAWRAT) should be used - external organisations / use to support scheme assessments /design -- outsourced [Science-Based]	Model calculates water quality impacts for comparison with legal UK Thresholds (Water Framework Directive).	Information used to determine the significance of scheme impacts and whether a scheme needs an EIA or not. Where an EIA is required the scheme is referred to the planning inspectorate and adds up to 2 years to the programme.	The Highways Agency Water Risk Assessment Tool (model) was developed by the Water Research Council for use on HA Schemes . It was implemented in 2009 and been in use since with no known problems and is subject to good assurance processes. These include; beta testing at development stage with user community; validation of model at development stage using 'real world' data; internal check and reviews by the consultants building the model; external peer review and QA assurance undertaken by Environment Agency - passed as 'fit for purpose'; A requirement to follow guidance recognised as best practice (DMRB 11.3.10) Review of model outputs by project team on scheme by scheme basis Quality assurance guidelines and governance arrangements defined within contract documents; High levels of transparency through publication of model methodology and results and by thorough model documentation; and Post Opening Project Evaluation (POPE) comparing forecasts project environmental outcomes and actual project outcomes.	●	●	●	●		●			●	●
DfT	M25 DBFO Financial Model. [Financial Evaluation]	Calculates the project IRR. Calculates cover ratios - eg Annual Debt Service Cover Ratio Following agreed changes is used to derive the Annual Service Payment payable.	Impacts on the amounts payable under the contract Banks rely on the model to demonstrate the PFI project is performing in line with plan and cover ratios being met. Failure to do this will lead to remedies and potential contract default.	Annual updates internally reviewed by HA, Change updates subject to external independent audit, Advice sought by HA where appropriate from external financial advisors on model updates.		●	●	●			●	●		●
DfT	Severn River Crossing. [Forecasting]	Cash flow model for the Severn River Crossing concession. Shows cash flows for the remaining concession period. Shows that sufficient cash will be available to repay lenders. Predicts the end point of the concession.	Determines the end point of the concession.	Model was subject to deveoper testing, use of verson contol. HA review of annual updates agreeing revenues to externally audited accounts. There is a full external model audit applied where there is a contractual change.	●		●	●			●	●		
DfT	Operational Cost Model for managed motorways. [Forecasting]	The model assesses the likely operational costs of managed motorways once they are constructed. This includes operating the managed motorway section and maintaining it.	Used to calculate scheme economics figures, anticipate and plan for expenditure spikes (e.g. for capital renewals) and sense-check expenditure estimates from service providers.	Developer testing, internal and external peer review, version control, annual review, review of new updates.	●	●	●	●				●		●
DfT	MOT Volume forecasting model. [Forecasting]	The model forecasts future private volumes of MOT tests. "MOT tests" are periodic roadworthiness tests of motor vehicles such as private cars, light goods vehicles motorcycles and private buses -but not heavy goods vehicles (HGVs) (over 3.5t) of public service buses and cosches (PSVs) used for hire and reward. Key outputs are volume forecasts used in routine HR and financial planning processes.	The model is used to plan business resources and forecast income and expenditure.	This model was initially produced by consultants and has been subject to developer testing, internal peer review, external peer review, the use of version control and quality assurance guidelines and governance.	●	●	●	●		●				●
DfT	Individual fee calculator. [Forecasting]	The model calculates revised amounts for individual fees from existing fees. It does this by applying percentage changes from each fee change driver to those fees or elements of fees to which the particular driver is appropriate. It then applies current rounding policy determine the fee to be charged. Exceptions (e.g. not applying current rounding policy where fees are not changing as a result of other drivers; not applying fee increases to low turnover schemes where the cost of fee change is disproportionate to yield) are dealt with manually at individual fee level. Key output is the amount to be charged for each fee. Because of the range of services which VOSA provides, there are about 350 individual fees.	Errors would mean over or under charging customers and unplanned changes in VOSA's income.	This model has been subject to developer testing, internal peer review, external peer review and the use of version control. Outputs are governed by a steering group and are included in the public consultation on fees. The model is reviewed with each fee cycle.	●	●	●	●				●	●	●
DfT	HGV/PSV Volume forecasting model. [Forecasting]	The model forecasts future volumes of roadworthiness tests of heavy goods vehicles (>3.5 tonnes), large goods trailers and public service vehicles (buses and coaches used for hire and reward). Key outputs are volume forecasts used in routine HR and financial planning processes.	The model is used to plan business resources and forecast income and expenditure.	This model was produced by consultants and has been suject to developer testing, internal peer review, external peer review, the use of version control, and QA guidelines. external audit, and governance. The model has been reviewed to compare to actual results and confirm assumptions.	●	●	●	●		●		●		●
DfT	Business Model (in-house forecasting model). [Financial Evaluation]	Calculates the cost of transactions. Determines the funding entitlement via DVLAs SLA with DfT.	Determines the funding entitlement via DVLAs SLA with DfT. Underpins unit costing used as part of the business case process. Used to assess financial impact of initiatives, e.g. Channel shift. Determines the mix of approriated in aid and consolidated fund extra receipts.	The model was subject to developer testing and the use of version control. There is a rigorous reconciliation process and it has been audited by both internal and external audit. Results for SLA are challenged at quarterly governance boards with DfT and are in the public domain through the Business Plan.	●	●		●	●	●	●	●	●	●
DfT	Volume Forecasts. [Forecasting]	Collates forecast volume levels for all DVLA transactions.	Volume forecasts underpin our I&E, fee, cost. procurement and resource models.	The model is subject to peer review and the use of version control. There are a set of QA guidelines used. Model results are signed off through a governance process and the results are in the public domain throguh the business plan.		●		●		●		●	●	●
DfT	Fee Model. [Financial Evaluation]	Calculates fee income per major transaction and the associated cost.	Used as part of fee setting process. Ensures fees are set at the correct level to minimise end of year surplus/deficits.	The model is subject to peer review and the use of version control. There are a set of QA guidelines used. Model is reviewed annually, the results signed off and the outputs are in the public domain through the publications of fee structures and consultations.		●		●		●		●	●	●
DfT	Ad Hoc Fees, Charges and Costs Models. [Financial Evaluation]	Calculates appropriate fees, charges or costs dependent on the scenario and based on the requester specification. The purpose of the model could be to assist in the production of a business case, cost out a service provision, and establish a suitable charge or fee for a service provision.	Less critical but can often underpin major business decisions.	Models are subject to internal peer review and generally challenge from external departments. Each iteration of the model is subject to version control. Models are subject to sign-off and are reviewd periodically.		●	●	●		●		●		●

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DfT	Modernising Driving Test Financial Evaluation. [Financial Evaluation]	It evaluates the financial viability of the options proposed by the project, both internally and externally. It is the basis of the impact assessment being drafted for consultation. It suggests the level of fees to be charged. Model used to generate business case.	Modernising the driver training industry is referred to in the Strategic Framework for Road Safety. The associated consultation is a business target. There is potential for reputational damage if DSA does not align its processes with its published statistics.	The model was subject to developer testing, version control and internal peer review including by a DfT economist review and DfT finance. The model is subject to Project and Programme Board governance. The results will be published through an Impact Assessment.	●	●		●					●	●	●
DfT	Procurement programme Supplier financial evaluation model prior to tender evaluation. Based on DfT template. [Procurement & Commercial]	Gives an opinion whether the supplier has the finances necessary to handle a contract of a given value. If not, parent company or bank guarantees may be required.	Part of the supplier selection decision. Decision may be subject to challenge under the Public Procurement Regulations leading to serious financial and reputational damage.	The models have been subject to developer testing, internal peer review, external peer review, version control, transparency and assessment of fitness for purpose.	●	●	●	●	●			●	●	●
DfT	Procurement programme Pre-Qualification or Pre-Evalauation Questionnaire. Based on DfT template. [Procurement & Commercial]	Covers mandatory grounds for excusion (e.g. criminal conviction) and technical capacity (e.g. experience). Used to shortlist suppliers invited to tender or whose tenders will be evaluated further.	Part of the supplier selection decision. Decision may be subject to challenge under the Public Procurement Regulations leading to serious financial and reputational damage.	The models have been subject to developer testing, internal peer review, external peer review, version control, transparency and assessment of fitness for purpose.	●	●	●	●	●			●	●	●
DfT	Procurement programme VfM and affordability model for tender evaluation. Based on DfT template. [Procurement & Commercial]	Balanced scorecard covering both technical/quality and financial factors to calculate the tender offering the best overall VFM.	Drives the contract award decision. Decision may be subject to challenge under the Public Procurement Regulations leading to serious financial and reputational damage.	The models have been subject to developer testing, internal peer review, external peer review, version control, transparency and assessment of fitness for purpose.	●	●	●	●	●			●	●	●
DH	CCG (Clinical Commissioning Group.) (Developed for NHSCB.) [Allocation]	Estimates the need for resources in CCGs and calculates actual allocations based on affordability/vfm - to determine the level of resources provided to CCGs for their responsibilities.	Drives distribution of resources to local commissioners.	Methodology externally recommended and developed to meet set objectives. Application QA'ed in team (e.g. all parts of model reviewed and developed by more than one analyst; version control and staged approach allows sense of updates to be checked iteratively) and external QA completed. Overall opinion of external QA was positive with helpful recommendations for establishing a more robust approach in future, particularly formalising some of the existing approach.	●	●	●	●	●		●	●	●	●
DH	Workforce affordability and pay bill models (individual ones described below). [Financial Evaluation]	A range of models assessing affordable workforce size, estimating upfront running costs associated with workforce expansion and estimating the historical breakdown of pay bill by staff group - outputs are used in central affordability planning, SR process, also feeds into wider HMT and OBR economic modelling. Informs further modelling by NHS Pensions Authority and Government Actuary's Department on NHS Pension Scheme. Widely used to inform internal briefing. Internal pay bill and workforce forecasting. Supporting consideration of pay reform.	Used to estimate affordable workforce size over SR period, to consider HCHS pay bill affordability and to estimate impacts of changes to pay policy.	QA by workforce Division within DH. Currently 4 analysts know how the model works.. Costs generally scrutinised by e.g. RIB and non-workforce policy colleagues. Further peer review between workforce Division and NHS Employers analysts.	●	●	●	●		●		●	●	●
DH	Pandemic Flu planning & response. [Planning]	Modelling impact of future pandemic, modelling impact and cost effectiveness of countermeasures. Real time modelling of a pandemic to inform COBR. Outputs contained in 'Modelling summary', the main analytical guide to pandemic planning. Pandemic preparedness plans. Stockpile procurement. Decisions by COBR and others in pandemic. Supports WHO and ECDC. Identifying pressure points on NHS.	A pandemic (of influenza) is considered the greatest medium term risk to nation in the National Risk Assessment/Register - Dynamic epidemiological models drive preparedness planning (e.g. the size of the antiviral stockpiles) and within pandemic decision making (e.g. if/when to cease elective hospital procedures).	Where possible multiple parallel streams of modelling are used and then discussed at the modelling expert group, SPI-M. The modelling summary is the group's consensus view. In a pandemic there will be two independent streams of real time modelling at separate research groups, with two further groups providing peer review.	●	●	●	●		●		●	●	●
DH	Primary Care Drugs Bill. [Forecasting]	Models the cost of the primary care drugs bill - inform policy decision making and spending reviews.	Informs spending review planning and prioritising of resources. Over/under-estimating would affect resources on other NHS services.	The model outputs are cross checked with past forecasts to ensure changes are consistent with changes to forecast assumptions. The assumptions have been discussed and agreed with MPI Branch within DH. The outputs and assumptions are also shared and discussed with HMT as part of the spending review process.	●	●	●	●						
DH	Public Health Allocation model. [Allocation]	Estimates the need for public health resources in local authority areas and calculates actual allocations based on affordability/vfm - to determine the level of resources provided to local authorities for their public health responsibilities.	Drives distribution of resources to local commissioners.	Methodology externally recommended and developed to meet set objectives. Application QA'ed in team (e.g. all parts of model reviewed and developed by more than one analyst; version control and staged approach allows sense of updates to be checked iteratively). Near final model (requirements were subject to final adjustments before announcements) underwent independent parallel build and external QA, with positive outcome and helpful recommendations for future. Implementation of final adjustments were QA'ed and reviewed within team to keep risks to an acceptable level.	●	●	●	●			●		●	●
DH	Social Care Grant allocation models. [Allocation]	A series of Excel models which calculate the adult social care relative needs formulae, and also DH grant funding for social care. The relative need formulae (RNF) are used by DCLG as part of their grant calculation. The grant calculations determine payments by DH to local authorities and also payments by the NHS to local authorities for social care.	Reputational damage.	The Relative Need Formula (RNF) calculations are double validated by matching with DCLG, and could be subject to an audit at DCLG. The DH social care grants are calculated independently by 2 members of staff. The RNF, and many of the allocation models, are published by DCLG.	●		●	●						●
DH	Long Term Financial Model (LTFM). [Financial Evaluation]	The model is used by Monitor's assessment team to understand the financial history, the current position and the financial forecasts of applicants for Foundation Trust status. The aim is to test whether applicants are financially viable (we also consider whether they are well governed and legally constituted. The model consists of three years of historical financial information, the current year's financial information and five years of forecast financial information with the first two years being split into monthly inputs. Inputs to the model include assumptions input by the applicant Trust, after accounting for growth and other factors. Assumptions are tested by Monitor's assessment team. Trust inputs are often derived from their own financial modelling. Outputs from the model include various statement documents for the applicant, a risk rating, scenario testing and a range of other analyses.	A key Government priority is the authorisation of all NHS trusts as foundation trusts. The LTFM is a key tool in assessing the financial viability of the applicant foundation trusts.	The model was developed internally by a modelling expert and has been externally audited by modelling experts as it has been further developed over several years. Small in-year changes are addressed by the internal model team and peer reviewed. For major changes, we use external review by a modelling expert in an accounting firm. Changes are further checked by the firm, Monitor's modelling team and by applicant trusts (users). Annual changes are written up by one person, input by a second and tested by a third. A senior manager reviews changes. The model has been extensively tested over time as it has developed. The team places greater scrutiny on outputs from major version changes.	●	●	●	●			●		●	●
DH	Social Care Pay and Prices. [Forecasting]	A series of Excel models which estimate social care related pay and prices inflation annually. Used to help estimate future spending needs for SR purposes.	Results published by PSSRU in their unit costs publication. Also used as input to SR bid, through the medium term projections model.	Input data for the models is obtained from annually published national data sources, from the ONS, Skills for Care, HMT and NHS Information Centre. All data inputs to the model are referenced and the same sources have been used each year. Pay data from ONS is extracted independently by two staff and checked for identical results. Outputs are reviewed in the context of indicators for the wider economy and sensitivity analysis is undertaken. The model is currently being reviewed for 2013, following changes to some of the data sources.	●	●		●					●	●

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DH	DH Social Care Funding Model. [Policy Simulation]	Costs reform options of the older adults social care system - supporting policy decision making.	Informing policy decision in high profile area.	During development there was extensive developer testing, Quality Assurance within the analytical team and systematic use of version control. An extensive comparison of results with the external Personal Social Services Research Unit (PSSRU) micro-simulation model has been completed and model design has been presented to the external academics. The PSSRU model has been peer reviewed by the Institute of Fiscal Studies (IFS). An external review will be completed to inform the next developmental stage of the model.	•	•		•					•	
DH	Adult Social Care Output Growth. [Forecasting]	Estimates ASC output growth as part of the national GDP growth annual estimates. Figures are also presented in ONS articles on total public sector productivity, of which ASC is a sub-section.	Estimates ASC output growth as part of the national GDP growth annual estimates. Figures are also presented in ONS articles on total public sector productivity, of which ASC is a sub-section.	The index is calculated independently by two members of the team. Results are cross checked and inconsistencies discussed with Information Centre colleagues, results are also checked by ONS (external review). All previous years' versions are archived to provide good version control. Emails between organisations (DH and ONS) are filed in the DH electronic filing system. Figures feed into GDP growth estimates, so ONS periodically publishes articles on Total Government productivity growth, of which this index is a sub-section. ASC figures are presented there. There are ongoing discussions with ONS and PSSRU on how to improve the measurement.	•	•	•	•						•
DH	DH Social Care Medium Terms Projections. [Forecasting]	Makes projections on the spend on Adult social care (ASC) - supporting policy decision making.	Used to inform spending review decisions.	The model has been through thorough developer testing and has been reviewed within the analytical team. The model takes key inputs on the projection of increased demand for services through demographic factors from the Personal Social Services Research Unit (PSSRU) Aggregate model. This model has been externally peer reviewed and there is a careful system of version control within the team.	•	•	•	•						
DH	DH Social Care Deferred Payment Agreement (DPA) Modelling. [Financial Evaluation]	Costs implementation options of universal DPA scheme - supporting policy decision making.	Used to inform policy design for DPAs in April 2015.	Through model development there was developer testing, version control and reviewed by another member of the analytical team. The model takes inputs from the DH Social Care Funding Model.	•	•		•						
DH	Generic Economic Model. [Financial Evaluation]	Costs various options as part of the options appraisal. Key output is identification of preferred option.	Drives evaluation of options.	Model produced externally on behalf of DH using Treasury appraisal principals. Formulae hardwired. Model populated by procuring organisations sometimes employing external financial consultants and then scrutinised by DH and Treasury officials as part of business case approvals.	•	•	•	•					•	
DH	CfH IT economic model. [Financial Evaluation]	Cost benefit analysis of short listed options - to identify preferred option.	Drives evaluation of options.	Model produced by DH Informatics Directorate and populated by procuring organisations. Formulae hardwired. Model and assumptions scrutinised by DH and Treasury officials as part of business case approvals.	•	•	•	•					•	
DH	Primary Care In-year drugs bill forecast. [Forecasting]	Projects in-year primary care drugs bill spend - inform in-year management of drugs spend.	Model, used at PCTs' discretion, to help PCT plan resources as drugs bill expenditure is not ring fenced and funding forms part of overall PCT Allocation. Increased expenditure will reduced expenditure in other NHS services.	The structure of the model, details of inputs required, underlying data used for development and methodology were tested by the North West Strategic Health Authority. The methodology was also shared with MPI Branch within DH as part of the QA process. The final model was tested by the developer and Manager.	•			•						
DH	Secondary Care Drugs Bill. [Financial Evaluation]	Models the cost of the secondary care drugs bill - inform policy decision making and spending reviews.	Informs spending review planning and prioritising of resources. Also used in NHS Tariff Uplift. Over/under-estimating would affect resources on other NHS services.	The model outputs are cross checked with past forecasts to ensure changes are consistent with changes to forecast assumptions. The assumptions have been discussed and agreed with MPI Branch within DH. The outputs and assumptions are also shared and discussed with HMT as part of the spending review process.	•	•	•	•						
DH	Health Service Cost Index. [Policy Simulation]	Price inflation in Hospital and Community Health Sector - estimate price pressure in NHS services and price negotiations.	Indicator of price inflation in NHS Hospital and Community Health Services. Discretionary resource available to NHS and wider community for negotiating uprating of contract values.	The model was produced internally a number of years ago and updates are made to individual components periodically. This is tested by the developer through consistency checking with past trends and outputs. The outputs are available in the public domain and therefore are open to challenges by the NHS and wider public, which act as a further check for the model.	•								•	
DH	Contractual Framework for Community Pharmacy (CFCP), Margins Survey & Drug Tariff. [Financial Evaluation]	The survey estimates the margin earned by community pharmacies on drugs dispensed, with a subsequent model to adjust generic drug reimbursement prices accordingly. Survey results are used to inform discussions with the Pharmaceutical Services Negotiating Committee (PSNC) regarding pharmacy funding and for subsequent adjustment to the Drug Tariff for generic .medicines (Category M).	The model is a system consisting of interlinked sub-models as follows. The Scheme M model - this sets the pharmacy reimbursement prices published in Part 8A of the Drug Tariff i.e. prices for commonly prescribed generic drugs in Category M, The Medicines Margin Survey - this estimates the amount of margin earned on dispensing by the independent pharmacy sector that is in excess of the £0.5billion stipulated by the Community Pharmacy Contractual Framework and adjusts reimbursement prices to deliver this level of margin. Together, these ensure that the pricing of generic drugs is transparent, reflective of market prices, supports competition in the pharmacy sector and the generic drugs market, and ensures the ready availability and supply of medicines to patients.	Developer testing - The original system, which was developed in 2005, was tested and improved with input from external academic experts; proposed methodology improvements are scrutinised by independent statistical experts retained by DH and by PSNC, the industry representative Internal review - Model outputs checked and verified by MPI analysts and policy colleagues External review - Data inputs shared with and checked by PSNC; Model outputs checked and verified by PSNC's independent statistical adviser. Fitness for purpose - Regular audit of accuracy of results, which drive improvements to methodology.	•	•	•	•	•	•	•	•	•	•
DH	Wider Societal Benefits (Value-Based Pricing). [Financial Evaluation]	Estimates the net economic impact of health states and treatments, beyond the patient - informing development of medicine pricing mechanisms. Cost-benefit analysis and evaluation of treatment programmes and policies.	Would be used to set medicine prices. Currently in development, and policy is not finalised.	Internally by MPI analysts, review by analysts in the Office of the Chief Analyst (independent internal review), also shared with various external academics. A technical workshop in October 2012 was used to implement a thorough analysis.	•	•	•	•						
DH	ScHARR model (Alcohol policy). [Policy Simulation]	Developed by ScHARR as a tool to examine impact of alcohol policy interventions - it is the first port of call for analysis supporting alcohol policies, e.g. current consultation on min unit pricing.	Supports highly sensitive policies (e.g. Minimum Unit Pricing). Results disputed by some stakeholders.	Peer reviewed journal articles, reports produced for the National Institute for Health and Clinical Excellence, reports produced for the Scottish government. The current model has been developed under DH research oversight, including a research advisory group. Development of a revised version of the model is being funded by MRC and overseen by a panel of international experts.	•	•	•	•	•	•		•	•	•
DH	DH tobacco model. [Policy Simulation]	Life table model to establish lifetime benefits of quitting smoking - standard means of evaluation tobacco policies in DH.	(Borderline - not necessarily business critical). Supports highly sensitive policy options (e.g. banning of retail tobacco displays, plain packaging of tobacco products). Tobacco regulation often subject to legal challenge from industry, in which robustness of modelling underlying IA is questioned.	Models are carefully checked by the team developing them. Comparison with dynamic simulation model at York University gives similar results.	•			•						
DH	Healthy Start analysis and modelling [Policy Simulation]	Estimates the numbers of recipients and future costs of options for Healthy Start under Universal Credit regime - supporting policy decision making.	The analysis and modelling estimates the numbers of recipients and the future costs of options for the Healthy Start (food voucher) scheme under Universal Credit regime. Healthy Start currently issues around 2.7 million vouchers to around 440,000 families across the UK. This is a relatively high profile health policy linked to a very high profile benefits policy.	Internal checking and peer review within DH Health Improvement Analytical Team. Model inputs and assumptions agreed with Healthy Start policy team (including those inputs which derive from DWP modelling). Comparison of early output with alternative system dynamics model gives similar results. Results of modelling work shared and discussed with policy team.	•	•		•						

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DH	NICE technology appraisal - financial evaluation model. [Policy Simulation]	The model supports assessment of the clinical and cost-effectiveness of medicines and other health technologies. A positive assessment by NICE results (by default) in a statutory requirement on the NHS to fund the intervention in question.	Drives key funding decisions and very high funding profile.	Methodological approach maintained by NICE: subject to periodic formal review including stakeholder engagement and full public consultation. Great majority of modelling work / model-busting carried out by independent academic or commercial units under contract to NIHR and applying relevant research governance and QA arrangements. NICE also commissions some modelling and methodological support direct, again from independent and reputable academic units. Public consultation stage is built into NICE appraisals, and this includes visibility of the underpinning evidence review / modelling work.		●	●	●	●	●	●	●	●	●
DH	Vaccination/ immunisation - (see also HPA vaccine policy change model described elsewhere in this return). [Policy Simulation]	Impact and cost effectiveness of new and modified Immunisation programmes. Used to support JCVI (main Immunisation expert group) discussions, decisions to go forward with new programmes and in procurement decisions.	Drives decision to recommend new vaccine programme (or to discontinue an existing programme) by the appropriate expert group, the JCVI. Models evaluate both impact and cost effectiveness. The models also generate the criteria and fundamental weightings for procurement evaluations.	DH intelligent customer review followed by review by JCVI expert group (Joint Committee on Vaccination and immunisation). Models go through a formal peer review process before being considered by the JCVI itself. The JCVI will also consider similar alternative models in the scientific literature. Where possible modelling results are published in peer reviewed journals. A parallel stream of 'second opinion' modelling should be available from August 2013.	●	●	●	●		●			●	●
DH	vCJD (variant Creutzfeld Jacob Disease). [Science-Based]	Risk assessment for secondary (person-to-person) transmission, especially via donated blood. Analysis of cost effectiveness of interventions - to inform decisions on precautionary measures.	Risk assessment for secondary (person-to-person) transmission, especially via donated blood. Modelling has influenced decisions against further intervention: risks are mainly reputational.	Model inputs, assumptions and methodology endorsed by scientific advisory committees. Model developed in part with CORU (UCL): some mutual QA.	●	●	●	●		●			●	●
DH	Public Health England Reward strategy. [Financial Evaluation]	Estimation of future salary-related costs for staff transferring into PHE under alternative reward strategies. Used to inform HR conditions for staff transferring into Public Health England, in consultation with HMT, Cabinet Office.	Feeds into Reward Strategy Business Case which will drive decisions on future salaries, pensions, t & cs for PHE - these are critical to the operation of PHE.	The core structure of the model was designed with input from an external consultant, who then quality assured the initial model and a later version. As flexibility was introduced to the model, as required by introduction of new policy options, results were checked with previous versions to ensure consistency. High-level indicators (such as the pension contribution to salary ratio) were also monitored. The model has also been reviewed by a colleague who has not been involved in the project.	●	●		●			●	●		
DH	New Fees Model 2013-14. [Procurement & Commercial]	It is used to underpin the Fees Scheme that CQC use to charge its providers. There are two key outputs: 1. Total fees generated by providers for funding. 2. A Fees scheme that produces expected revenue within sectors and does not lead to over-charging.	It underpins our key funding decisions in matching up how we charge fees with the amount generated.	The model is aligned to the detail that is obtained from the Finance system. It is developed in conjunction with the Fees Scheme, so as well as supporting this work, the work also helps to validate the accuracy of the model.	●	●	●	●	●		●	●	●	●
DH	Multi professional Education and Training (MPET) review transition models. [Financial Evaluation]	A suite of models which calculate the transition path for providers to move to new education and training tariffs - as basis for SHAs (LETBs) to move providers to a tariff-based funding approach.	Used to identify education and training funding changes at provider level.	Model owned and developed by non-analytical policy team. Version control and developer testing were both applied by this team. Workforce Division Analysis Team (WDAT) provided advice on model design. WDAT carried out regular testing and quality assurance during the development process. NHS colleagues carried out a detailed QA of the final iteration of the model; sense-checking the inputs and outputs as well as checking the logic of the model.	●	●		●		●		●		
DH	Social Work Bursary model. [Financial Evaluation]	Drives key funding decisions, option appraisal and impact analysis for SWB reform.	Drives key funding decisions, option appraisal and impact analysis for SWB reform.	Model outputs are shared with finance, policy and other colleagues. Developers have 'walked through' the model with finance colleagues (internal review). Methodology papers were shared with project group and policy leads. Version control is assured by using naming conventions in current and archived folders. Overall ownership sits with senior analyst in workforce division. Some outputs are published in consultation documents.	●	●		●		●		●	●	
DH	Costing model for the new NHS Education and Training System. [Financial Evaluation]	Estimates the costs of the new E&T system (HEE etc.) based on a number of assumptions - fed into Impact Assessment.	Used to estimate costs arising from the changes to the E&T system architecture and other reforms.	Version control and developer testing used. Model was quality assured within workforce division. Model outputs were shared with education and training and education funding policy experts for sense-checking. Finance colleagues were consulted on appropriate assumptions to use for inputs to the model.	●	●		●		●		●		
DH	Sickness Absence Model. [Forecasting]	Models expected sickness absence rates for individual NHS organisations, taking account of organisation type, staff mix and local population health - to estimate potential savings from reducing variation/ candidate interventions; to identify poor performers.	Feeds into broader work on productivity. Potential reputational risk if assumed impacts of policy are not realised.	There is a structured approach to developer testing and internal peer review by colleagues, complemented by a careful system for version control. Totals are cross-checked with published statistics, methodology discussed with colleagues. Separate scenarios are developed for different options.	●	●		●					●	
DH	Other Sickness Absence modelling and monitoring. [Forecasting]	A range of modelling work: 1)Calculating target rates and estimated savings for each SHA, based on pay bill, sickness absence rates and population health. 2)Calculating the 12-month moving average by SHA; compares with previous periods and plans; RAG rates; estimates £ savings achieved. 3)Estimating the number of staff working days available and the number lost to sickness absence in each NHS organisation. 4)Estimating average sickness absence rates for the new SHA regions. 5)Estimating the number of staff working days available and the number lost to sickness absence in each NHS organisation type. 1)To inform negotiations with SHAs on allocation of shares of the national (Boorman) ambition, 2)Directors, WLG, SHAs and national QIPP to take action as necessary, 3)Provided to Trusts & PCTs to check and include in their financial accounts, 4)To assess changes in NHS staff morale.	Feeds into broader work on productivity. Potential reputational risk if assumed impacts of policy are not realised.	There is a structured approach to developer testing and internal peer review by colleagues, complemented by a careful system for version control. Totals are cross-checked with published statistics, methodology discussed with colleagues. Separate scenarios are developed for different options.	●	●		●					●	
DH	SHA Agency Costs Targets. [Forecasting]	Range of models on agency costs: Calculating options for SHA shares of the national QIPP target and trajectories based on e.g. pay bill, previous expenditure and improvement. Establishing the baseline and monitors progress against baseline and SHA plans. Analysing quarterly estimates against previous periods to assess progress - to inform negotiations with SHAs on sharing out the national target reduction	Feeds into broader work on productivity. Potential reputational risk if assumed impacts of policy are not realised.	There is a structured approach to developer testing and internal peer review by colleagues, complemented by a careful system for version control. Totals are cross-checked with published statistics, methodology discussed with colleagues. Separate scenarios are developed for different options.	●	●	●	●						
DH	Dental care pathway simulation model. [Policy Simulation]	Estimates the cost of the proposed care pathway in NHS dentistry - currently supporting policy decision making with respect to piloting the proposed new dental contract. This model is currently in development, and additional QA processes are planned.	Informs the design of the new dental contract.	This model is currently under development. The assumptions underpinning the current version have been reviewed by the programme team and the workings checked by other analysts in the team. As the model develops, we are planning a full external review by the programme's Evidence and Learning Reference Group comprising a number of health economists and other academics specialising in dental health. We also plan to publish a technical consultation on the detail of the model.	●	●		●						
DH	Dental Charges Uplift Model. [Forecasting]	Estimates the financial impact of various patient charge uprating options (how much additional income would be generated) - supports policy decision on Patient charge up-ratings.	Supports policy decision on Patient charge up-ratings.	This is a simple model which is subject to a thorough internal QA process. The calculations are checked by a senior analyst and there is a careful system of version control. The options modelled are not published but the final decision is.		●		●					●	●
DH	Optical Voucher Uplift Model. [Forecasting]	Estimates the financial impact of various optical voucher uprating options (how much additional expenditure would be needed for PCTs to cover uprating) - supports policy decision on optical voucher up-ratings.	Supports policy decision on optical voucher up-ratings.	This is a simple model which is subject to a thorough internal QA process. The calculations are checked by a senior analyst and there is a careful system of version control. The options modelled are not published but the final decision is.		●		●					●	●

Dept	Model name and type	Description	Why model is Business Critical	Summary of QA	Developer Testing	Internal Peer Review	External Peer Review	Use of Version Control	Internal Audit	Quality Assurance Guidelines	External Audit	Governance	Transparency (published results)	Periodic Review
DH	Quality Outcomes Framework model. [Financial Evaluation]	Estimates the financial impact to practices of various contract changes to the Quality Outcomes Framework - supports policy decisions regarding national negotiations with the General Practitioners Committee.	Model informs strategies for negotiations and actual negotiations between department and general medical practioner's committee.	A tactical model for which the logical structures follow the legal instructions on payment calculations as laid out in the Statement of Financial Entitlement. Model is not subject to development work just updated as new data is published by the NHS Information Centre. Model is subject to an internal QA process by different analysts and checked for consistency and logic against previous years and the official published results. Model outputs have been assessed as fit for purpose though the negotiation process and by review of internal and external analysts.		●	●	●	●	●			●	●
DH	Global Sum / Minimum Practice Income Guarantee model. [Financial Evaluation]	Estimates the financial impact to GMS practices of changes in the Global Sum / MPIG - supports policy decisions regarding national negotiations with the General Practitioners Committee.	Model informs strategies for negotiations and actual negotiations between department and general medical practioner's committee.	A tactical model whose logical structures follow the legal instructions on payment calculations as laid out in the Statement of Financial Entitlement. Model is subject to an internal QA process by stakeholders and analysts and checked for consistency and logic. Model outputs have been reviewed and assessed as fit for purpose though the negotiation process. Model is checked for consistency with results collected through other internal data feeds.	●	●	●	●	●				●	●
DH	Uplift and Clinical Negligence Scheme for Trusts (CNST). [Forecasting]	Adjustment to national tariff to reflect future cost pressures. In national tariff.	A key feed into the NHS Tariff.	Payments for NHS organisations determined by actuarial assessment carried out be a firm of actuaries.		●	●		●		●			●
DH	Lab models of (i) human infectious disease or (ii) microbial contamination. [Science-Based]	(i) Simulates human (potentially fatal) disease to allow efficacy evaluation of new vaccines/therapeutics, and (ii) simulates microbial contamination (e.g. Pseudomonas in taps) to allow design and testing of effective control measures to reduce risk.	(i) Influences customer investment decision in vaccine/therapeutic development/purchase, and (ii) influences policy/guidelines on best practice in e.g. healthcare settings.	Best scientific practice to ensure the models match the real life situation as closely as possible. E.g. for animal model of infection, the disease process (dose, route of infection, time of onset, clinical signs, immunology, pathology, bacterial/viral load in tissues/samples) should match human disease as closely as possible.	●	●	●	●		●		●	●	●
DH	Modelling the risk of a potentially infectious donation entering the blood supply. [Science-Based]	This model estimates the risk of a potentially infectious donation entering the blood supply in the UK - the risk is estimated for 3 viral makers of infection, these are part of the routine screening tests of NHSBT: HIV, hepatitis B and hepatitis C.	Essential in monitoring the ongoing small, but potential risk of an infectious unit of blood entering the blood supply and potentially infecting a recipient. A modified form of this model has also been used to estimate impact of a change to testing regimes i.e. change to NAT pool size; and the potential impact of a change to blood donor selection policy.	This model has been designed and implemented to estimate possible risks to blood safety, and make use of retrospectively collated information sources on infected donors, laboratory testing practices and viral natural history studies to inform model parameters, the uncertainty surrounding those parameters, and generalisability.	●	●	●	●	●	●			●	●
DH	Vaccine policy change models. [Policy Simulation]	Understand the health and economic implications of a change in vaccine policy.	Used for informing national policy (and where appropriate procurement).	Validated against best data and best practice in the field; extensive sensitivity analysis following NICE guidelines; three levels of review (internal to HPA during development phase, organised by DH (the key stakeholder) , organised by external journal). Also reviewed by Committees (sub-committees of and main JCVI).	●	●	●	●	●	●	●	●	●	●
DH	Disease burden models. [Science-Based]	These models provide national and other sub-national point and interval estimates of the prevalence and incidence of infections at different disease stages e.g. HIV and Hepatitis C.	Essential in providing a robust approach to estimation of the total number of individuals living with these infections, ans is of particular importance in estimation of those currently undiagnosed. These models provide the definitive national estimates of disease burden.	Comparison made with previous years estimates and estimates made by others using alternative methodologies. Consistency of all data sources assessed and those which appear inconsistent are reviewed in detail and omitted when necessary. Methodology continually refined and applied to data sources from other countries. Methodology is made available publicly on HPA intranet and peer-reviewed publication.	●	●	●	●	●	●		●	●	●
DH	Real-time pandemic influenza model. [Forecasting]	The model provides national and regional estimates of the current and projected number of symptomatic and asymptomatic cases of influenza during and epidemic. It also provides estimates of key epidemiological parameters such as the case-fatality rate, case-hospitalisation rates, reproduction number.	Essential to provide the evidence base to enable rapid national control and mitigation strategies during an pandemic and projections of healthcare utilisation for planning purposes.	Validated against best practice in the field; three levels of review (internal to HPA during development phase, organised by DH (the key stakeholder) , organised by external journal). Also reviewed by Committees (including SPI-M).	●	●	●	●	●	●	●	●	●	●
DH	EARLY (Estimating Aerosolised Release Locality). [Science-Based]	Estimates extent of population exposed to an airborne biological agent based on home and work locations of early cases and time of onset of symptoms. Its key outputs are estimates of the administrative areas or post code geographies that has been compromised by the release to aid further consideration of targeting of countermeasures.	Feeds into HPA/PHE/DH with policy related to the National Risk Assessment, and would be used to assist HPA/PHE/NHS in responses to potential airborne releases, backed up by ground truthed epidemiological data and site investigations.	Internal HPA review. External academic review (model jointly developed with leading group at Imperial). External peer review by publication in learned science journal.	●	●	●	●	●	●		●	●	●
DH	LOST (Legionella Outbreak Statistical Tool). [Science-Based]	Estimates the release window in time following a biological agent dissemination event, for any agent with well characterised incubation period, that has no evidence of dose dependent variation in incubation period; for example Legionella pneumophila release from cooling towers. Output the timing of the release and estimated final number of cases for an ongoing outbreak.	Supports outbreak investigation by the outbreak control team.	Internal HPA review. External peer review by publication in learned science journal.	●	●	●	●	●	●		●	●	●
DH	SHMI - Summary hospital-level Mortality Indicator. [Science-Based]	Estimates number of deaths following admission to hospital and compares with actual numbers. Outputs a banding for each hospital based on whether actual numbers are as expected, below expected or above expected.	Errors could lead to reputational damage.	Initial development was directed by a multi-agency technical group and had input from academia for the statistical modelling itself. Now in production at the HSCIC quarterly QA takes place both internally and externally before publication. Development plan exists for which a technical group have oversight. Used Indicator Assurance Service to QA part of indicator.	●	●	●	●	●	●		●	●	●
DH	BCBV - Better Care, Better Value Indicators. [Financial Evaluation]	Better Care Better Value indicators identify potential areas for improvement in efficiency which may include commissioners re-designing and shifting services away from the traditional setting of the hospital and out towards community based care.	Errors could lead to reputational damage.	Now in production at the HSCIC quarterly QA takes place both internally and externally before publication. Used Indicator Assurance Process to QA indicators when taken on from NHS Institute.		●	●	●		●		●	●	
DH	CQC quantified risk assessment model. [Policy Simulation]	Estimates costs and benefits of CQC regulation for certain health or social care activities - Supporting policy decision making.	Informs DH decisions about the legal scope of CQC's remit, but only for very small marginal changes.	A simplified version of model developed by consultants a few years ago. Model use now QA'd within team and through IA QA processes e.g. senior analyst sign off and RPC.	●	●	●	●						
DH	Medical workforce supply model. [Forecasting]	Forecasts supply of doctors in the medical training pipeline - feeds into pay bill modelling and wider affordability modelling.	Drives affordability modelling.	QA by workforce Division within DH. Model outputs compared to & validated with CfWI strategic workforce models.	●	●		●		●			●	
DH	Nursing workforce supply & increment model. [Forecasting]	Forecasts supply of qualified nurses - feeds into pay bill modelling and wider affordability modelling.	Drives affordability modelling.	QA by workforce Division within DH. Model outputs compared to & validated with CfWI strategic workforce models.	●	●		●		●			●	
DH	HV workforce supply model. [Forecasting]	Forecasts supply of Health Visitors and training investment required to meet the target FTE (full time equivalent) increase of 4,200 by 2015 - used to QA SHA training plans, to provide indicative scales for training investment to policy colleagues.	Used to QA SHA workforce plans to reach 4,200 FTE workforce expansion.	QA by workforce Division within DH and by SHA colleagues. Uses similar broad principles to other workforce supply models.	●	●	●	●		●			●	

Dept	Model name and type	Description	Why model is Business Critical	Summary of QA	Developer Testing	Internal Peer Review	External Peer Review	Use of Version Control	Internal Audit	Quality Assurance Guidelines	External Audit	Governance	Transparency (published results)	Periodic Review
DH	NHS workforce supply and demand models (Centre for Workforce Intelligence). [Forecasting]	Supply models: model likely size of available and qualified workforce based on current and future training numbers, retirement rates etc. Demand models: model likely size of workforce required based on population size and morbidity, technology and expectations; resources available etc. The model supports SHA (LETB) decisions on number of educational places (non-medical) to commission; HEFCE on size of medical and dental student intake and HEE on number of hospital training places for junior doctors.	Use to inform decisions on student entry numbers for doctors & dentists; training numbers for junior doctors; and commissioning numbers for other professionals.	QA by workforce Division within DH. Core modelling developed and quality assured by consultants on behalf of CfWI. Methodology makes extensive use of scenario development and Delphi process working with a range of stakeholders.	●	●	●	●		●		●	●	●
DH	Workforce affordability model. [Financial Evaluation]	Assesses affordable workforce size based on affordability, pay pressures and skill mix solutions - outputs are used in central affordability planning, SR process, also feeds into wider HMT and OBR economic modelling.	Used to estimate affordable workforce size over SR period.	QA by workforce Division within DH. Currently 4 analysts know how the model works.	●	●		●		●		●		●
DH	Workforce costing model for e.g., workforce elements of new policy initiatives. [Financial Evaluation]	Estimates up-front and running costs associated with workforce expansion to meet new policy initiatives (e.g., Health Visitors) - used to inform IAs and wider policy costings.	Used to analyse costs of policies and therefore drives key funding decisions.	QA by workforce Division within DH. Costs generally scrutinised by e.g. RIB and non-workforce policy colleagues.	●	●		●		●		●		●
DH	Hospital and Community Health Services (HCHS) Pay bill Modelling Suite. [Forecasting]	Suite of models to: Estimate breakdown of historical pay bill by staff group and cost stream; quantify historical pay bill drivers (e.g. pay drift and its components); links with workforce planning models to forecast future pay bill; specific off-shoot models to cost specific proposed pay reforms (e.g. junior doctor contract review and review of consultant doctor reward package); informs further modelling by NHS Pensions Authority and Government Actuary's Department on NHS Pension Scheme. Widely used to inform internal briefing. Internal pay bill and workforce forecasting. Supporting consideration of pay reform.	Used to consider HCHS pay bill affordability and to cost options for changes to NHS pay.	QA within workforce Division. Further peer review between workforce Division and NHS Employers analysts. The latter operate and lead on specific applications of the modelling, specifically live use during any contract negotiations.	●	●	●	●		●		●	●	●
DH	Calculation of national tariff for payment by results: National Tariff calculation. [Financial Evaluation]	Part of a suite of models to calculate a national schedule of prices for some NHS services: Calculates a national schedule of prices covering a range of services including the majority of acute services.	Provides the basis for reimbursement of the majority of hospital services. Determines funding flows relating to commissioner spend.	Extensive process of quality assurance and sense checking. This includes internal checking of model outputs and the use of commissioner and provider impact analysis to test outputs (see below). The prices produced by the model are subject to an internal review process of comparing year on year prices and relativities between prices. This process is documented. Following this stage impact analysis is conducted followed by a 'sense check' of the tariff that involves releasing the tariff to (a) a number of health economies across the country, including commissioners and providers, to check our impact analysis, and (b) clinical experts who review the prices. After the sense check process, a further internal review of the feedback is conducted and price adjustments made where necessary. This process is documented. The final 'testing' phase is when the tariff is subject to 'road testing'. Road testing the tariff involves publishing the tariff in 'draft' form alongside guidance. Although the intention is that the tariff is in its final stage, there is still scope to make amendments if any significant issues or errors were to come to light at this stage prior to publication of the final tariff. The publication of the tariff is accompanied by a 'step-by-step guide to tariff calculation' made available on the DH website.	●	●	●	●		●		●	●	●
DH	Calculation of national tariff for payment by results: National tariff impact analysis modelling. [Financial Evaluation]	Part of a suite of models to calculate a national schedule of prices for some NHS services: National, commissioner and NHS provider level assessment of impact of national tariff.	The impact assessment forms a key part of QA of tariff calculation model, and is used to inform decisions about tariff affordability and assess likely impact across NHS. The impact analysis is also used to assess policy in relation to national tariff (i.e.. through assessment of impact of particular decisions). The impact analysis assesses the overall quantum of spend associated with tariff and the impact on income and expenditure for trusts and commissioners respectively.	The impact analysis forms part of the Internal checks and quality assurance processes to quality assure the tariff itself and to provide an overall national assessment of tariff expenditure and to assess significant gains and losses across the NHS. After internal checks and review processes the impact analysis outputs are checked as part of the 'sense check process'. The tariff sense check process comprises local health economies using local data to replicate the impact analysis as a way of checking whether the internal impact analysis is robust.	●	●	●	●		●		●	●	●
DH	Calculation of national tariff for payment by results: Market Forces Factor. [Financial Evaluation]	Part of a suite of models to calculate a national schedule of prices for some NHS services: Determines the market forces factor for each provider reflecting the unavoidable cost differences associated with geographical location. This is used in a number of ways: (1) as a price adjustment adjustor to the price received under the national tariff (2) in determining the Reference Cost Index for trusts (the RCI is an index reflecting the relative cost position of each provider) (3) within the resource allocation formula for distributing funds to CCGs.	Drives funding flows across the NHS.	The quality review processes differ for each element of the MFF- staff, buildings and land. The most significant part of the MFF is the staff element. The calculation of the staff MFF is based on an externally commissioned model which derives spatial labour cost differences. The modelling and outputs are subject to a peer review process and QA through a technical advisory group which supports an independent committee advising on resource allocation formulae. Other elements of the MFF (land and building) rely on more routine data and updates. The analysis to support these other elements is carried out within DH and subject to internal review, checking and quality assurance processes.	●	●	●	●				●	●	●
DH	Calculation of national tariff for payment by results: Specialist top-up modelling. [Financial Evaluation]	Part of a suite of models to calculate a national schedule of prices for some NHS services: The model assesses the need for additional reimbursement for providers to reflect the additional costs associated with delivering specialist care and treatment. The model determines whether there is evidence to support the need for a top-up payment for certain categories of clinical services, and the required level of top-up payment (as a percentage uplift on the national tariff).	Drives funding flows across the NHS.	The econometric modelling was commissioned by an external academic team. The methodology and outputs were reviewed by an advisory committee made up of external analysts and academics. The analysis was subsequently published in a peer reviewed scientific journal and detail of the model made available through the DH website. The impact of the top-ups is assessed using the tariff impact model.	●	●	●	●				●	●	●
DH	Calculation of national tariff for payment by results: Payment and reference cost 'grouper' software (produced and published by the Health & Social Care Information Centre) - planning model to deliver key services. [Planning]	Part of a suite of models to calculate a national schedule of prices for some NHS services: Used to 'group' hospital activity into Healthcare Resource Groups, which form the basis for the unit of payment in the NHS. The grouper software is used by NHS commissioners and providers to plan, contract and pay for activity. The groupers are also used by the HSCIC to group Hospital Episode Statistics data which is used as an input to the tariff calculation model. The reference costs grouper is used by NHS providers to group activity to inform their annual submission of reference cost data to the Department of Health.	As the PbR tariff is set on a price per HRG basis, the tool that 'groups' or classifies patient records to HRGs is essential to the delivery of the reimbursement system for NHS providers.	Extensive QA process undertaken by IC and its contractors. This includes: developer testing strategies and plans following the ISEB v-model and testing using high volume test data; robust, documented and assured internal review processes; external review through seeking feedback from all users; use of OGC/PRINCE2 version control; a grouper audit spreadsheet documenting all changes considered and implemented; use of a standard quality assurance process comprising quality gates; detailed governance processes for sign off, including DH; publication of documentation detailing changes and content; and assessment against a set of case mix design principles to ensure fitness for purpose.	●	●	●	●	●	●	●	●	●	●
DWP	Administration costs model. [Financial Evaluation]	Estimates the administration costs to employers of the workplace pensions reforms.	Estimates from this model feed into impact assessments and influence decisions over whether the benefits of policies out way the costs associated with them.	External peer review of impact assessments by the Regulatory Policy Committee. Internal peer review of administration costs within DWP. External peer review of administration costs estimates by economists from BIS and the Better Regulation Executive.	●	●	●							●
DWP	Charge out rate-setting models for "Fee for Intervention" charging regime. [Financial Evaluation]	Calculates the charge out rate to apply to inspectors time when working with duty holders found to be in material breach of the law. Calculation is based upon analysis of work recording activity and direct/indirect costs. Model also facilitates the production of forecasts of expected cost recovery based upon assumptions of inspector activity and duty holder breach rates.	High profile policy initiative. Informs funding decisions in the current (and future) SR periods.	Through the development process the model was subject to internal developer testing and version control with inputs and outputs continually tested for reasonableness. The overall methodology was based on existing HSE cost recovery models which have undergone external review. The model has been subject to internal peer review and is currently being reviewed by external auditors (NAO). The model will be updated periodically and subject to ongoing internal and external review and quality assurance.	●	●	●	●	●				●	●
DWP	Contribution costs model. [Financial Evaluation]	Estimates the contributions costs to employers, individuals and the Exchequer (in tax relief) of the workplace pensions reforms.	Estimates from this model feed into impact assessments and influence decisions over whether the benefits of policies out way the costs associated with them.	External peer review of impact assessments by the Regulatory Policy Committee. Office for Budget Responsibility scrutinised the methodology behind the modelling of the impact on the Exchequer of the revised implementation schedule for the workplace pensions reforms. Internal peer review of contribution costs within DWP.	●	●	●							●

Dept	Model name and type	Description	Why model is Business Critical	Summary of QA	Developer Testing	Internal Peer Review	External Peer Review	Use of Version Control	Internal Audit	Quality Assurance Guidelines	External Audit	Governance	Transparency (published results)	Periodic Review
DWP	Cost Recovery Rate Setting Model [Planning]	Calculates the cost to HSE of delivering four separate regulatory regimes (COMAH, GSMR, Offshore and Boreholes). The model uses operational planning assumptions about the total number and mix of hours that will be delivered in the regulation of each regime. Calculates the hourly rate required to be charged to recover the total cost to HSE.	Informs key funding decisions, as HSE is required to fully recover the costs of regulating these regimes. Informs discussions with industry about the levels of regulation and hourly rates HSE will charge to recover its costs.	Model outputs are continually tested against out-turn data. Assumptions are consulted on and agreed internally within HSE and, along with methodologies, are updated to address known variances or in light of operational or policy developments. There has been periodic review and refinement of the model over the years. The current version was subject to external review in 2010.	●	●	●	●			●	●	●	●
DWP	Costs to Britain model. Total economic cost model. [Financial Evaluation]	Calculates present value total economic cost of occupational injury and ill health (excluding cancer), including estimated financial costs to employers, Government and individuals, as well as the monetised non financial cost of 'externalities' borne by individuals.	Model is primarily informative and tracks trends in health and safety outcomes. It is not used directly for funding decisions but its results are frequency cited as relevant context to many HSE activities.	The model was developed by independent researchers and was peer reviewed by independent experts. Any update is subject to rigorous checks by HSE analysts. Performance of the model with respect to integrity of calculations and completeness of the model is reviewed on an annual basis. Testing and investigation of any effects of changes is carried out by internal reviewers (statisticians and economists). The results are published annually with explanation of any changes resulting from updated data or methodological improvement.	●	●	●	●		●			●	●
DWP	Long Term Risk Model [Financial Evaluation]	A stochastic simulation model which projects the assets and liabilities of the Pension Protection Fund. Its key outputs are a probability measure of how likely we are to reach our long-term aim of self-sufficiency and a measure of our worst deficit (measured at the 90th percentile).	It is the tool that the PPF Board uses to assess its progress against its long-term funding strategy, and to make strategic decisions concerning the level of the PPF Levy and the investment strategy of the Fund.	Developer testing, Peer review, version control, internal audit, external audit.	●	●	●	●	●		●	●	●	●
DWP	National Employment Savings Trust (NEST) Loan model. Ownership of model shared between DWP and NEST. [Financial Evaluation]	Estimates overall workplace pension reform participation volumes. Estimates and forecasts NEST participation volumes. Estimates and forecasts NEST revenues, costs and funding requirement. Estimates NEST's annual drawdown requirement to 2020 and compares this to annual affordability limits set in the loan agreement between DWP and NEST.	The terms of the NEST loan are subject to the terms and conditions set out in a loan agreement with DWP. Strict affordability conditions are attached to the loan and the loan model is the key tool used to monitor whether these conditions are being met.	Model assumptions are peer reviewed by a working group comprising analysts from DWP, the Pensions Regulator and NEST Corporation. Governance arrangements in place to approve changes to the model and underpinning assumptions. Documentation produced for each new version of the model detailing modelling and assumptions changes. Internal spreadsheet error checks used.	●	●	●	●				●		●
DWP	The Pensions Regulator General Levy and Pensions Protection Fund Administrative levy calculator. [Financial Evaluation]	This is a fairly simple spreadsheet bringing together two different sets of exogenous information about the volume of pension schemes and members, and using that data to calculate what rates would need to be to to raise a specified amount of levy.	Drives funding decisions around levy-setting.	Model was developed by PPF with scrutiny from external experts (e.g. Hewitt Consulting, Government Actuary's Department). Major developments are peer reviewed by outside bodies (e.g. updates to the levy by Price Waterhouse Coopers, updates to CPI modelling by Government Actuary's Department). An audit trail used for each quarterly run of the model documenting the inputs and outputs of each step and which member of staff did and which checked each step of the production process. An external audit was conducted by KPMG in 2012 and progress against recommendations is reviewed regularly by Audit Committee.	●								●	●
DWP	Various - cost-benefit models for impact assessment. [Financial Evaluation]	Normally simple models that calculate the present value costs and benefits of regulatory proposals.	IA models can be essential to negotiation on EU directives, and choice/modification of UK policies.	Impact assessment model development follows standard government guidance including the HM Treasury Green book on policy appraisal and Better Regulation Executive guidance on impact assessment. The Health and Safety Executive (HSE) has also developed its own internal guidance on quality assurance of impact assessment. Model calculations and assumptions are internally peer reviewed. All impact assessments undergo Chief Economist sign-off prior to further scrutiny by the Regulatory Policy Committee.	●	●	●	●		●		●	●	●
DWP	Work Programme volumes and affordability model. [Financial Evaluation]	The model estimates the number of people expected to attach to the Work Programme in different payment groups, and the affordability of the programme.	Key programme for the Department. Expected Work Programme attachment volumes are published and made available to WP providers. Business critical to monitor the cost and affordability of the Work Programme.	The model estimates the number of people expected to attach to the Work Programme in different payment groups and calculates the affordability of the programme under different levels of Job Outcome and Sustainment performance. Expected Work Programme attachments are sent to Work Programme providers to aid their business planning and published in the House of Commons library. Affordability calculations are used in discussions with HMT and departmental financial planning.	●	●	●	●	●			●	●	●
DWP	Additional Pension long-term projection model. [Forecasting]	Projects expenditure for Additional Pension (S2P / SERPS) over 60 years. Outputs expenditure (separate caseload model), and estimates of accrued state pension liabilities (for ONS).	Projecting spending into the long term. Essential for long-term fiscal sustainability assessments, impacts of pension reforms, and ONS estimates of state pension liabilities.	Model developed by the Government Actuary's Department (GAD), who continue to run a model in parallel. Modelling is periodically shared between DWP and GAD to ensure consistency. Outputs scrutinised internally by policy analysts, and externally by GAD, ONS and OBR: OBR as part of their annual Fiscal Sustainability Report, ONS as part of their Pensions in the National Accounts work. An audit trail of changes to assumptions and their impact is maintained.	●	●	●	●			●	●	●	●
DWP	Attendance Allowance forecasting model [Forecasting]	Forecasts caseloads, benefit expenditure and workloads for Attendance Allowance. Inflow-outflow approach - modelling amounts for new awards, changes in status and amounts, and exits from benefit. Outputs expenditure, caseloads, average amounts, flows and workloads.	Forecasting benefit expenditure over next few years, essential for fiscal planning and management of government funding. Used to estimate impact of policy decisions worth several hundreds of millions of pounds, or more. Indirectly also influences need to make further policy changes. Assists with planning of workloads and allocations of DEL.	Model outputs regularly tested against out-turn statistical and expenditure data, reviewed and modified as necessary in light of variances and their causes. Outputs scrutinised by OBR and HMT as part of the bi-annual Economic and Fiscal Outlook forecasts. Assumptions consulted on within DWP with policy and delivery experts. An audit trail of changes to assumptions and their impact is maintained.	●	●	●					●	●	●
DWP	Basic State Pension long-term projection model [Forecasting]	Projects expenditure for Basic State Pension over 60 years. Outputs caseload and expenditure, and estimates of accrued state pension liabilities (for ONS).	Projecting spending into the long term. Essential for long-term fiscal sustainability assessments, impacts of pension reforms, and ONS estimates of state pension liabilities.	During development model validated against the previous model inherited from the Government Actuary's Department (GAD). Modelling is periodically shared between DWP and GAD to ensure consistency. Outputs scrutinised internally by policy analysts, and externally by GAD, ONS and OBR: OBR as part of their annual Fiscal Sustainability Report, ONS as part of their Pensions in the National Accounts work. An audit trail of changes to assumptions and their impact is maintained.	●	●	●	●			●	●	●	●
DWP	Financial Assistance Scheme forecasting model. [Forecasting]	Forecasts future cash flows for the Financial Assistance Scheme (FAS).	FAS is a large part of DWP DEL.	Model was develop by PPF with scrutiny from DWP and Government Actuary Department (GAD) (senior actuary also signs off the forecast). GAD also audited the model once it was built and National Audit Office (NAO) audit the forecasting process (not specifically this model).	●	●	●				●			
DWP	Housing Benefit forecasting model. [Forecasting]	Forecasts caseloads and benefit expenditure for Housing Benefit and Council Tax Benefit. Stock-driver approach - modelling caseloads (with reference to other benefits etc), and average amounts. Outputs expenditure, caseloads and average amounts.	Forecasting benefit expenditure over next few years, essential for fiscal planning and management of government funding. Used to estimate impact of policy decisions worth several hundreds of millions of pounds, or more. Indirectly also influences need to make further policy changes.	Model outputs regularly tested against out-turn statistical and expenditure data, reviewed and modified as necessary in light of variances and their causes. Outputs scrutinised by OBR and HMT as part of the bi-annual Economic and Fiscal Outlook forecasts. Assumptions consulted on within DWP with policy and delivery experts, and with other Government departments where relevant. An audit trail of changes to assumptions and their impact is maintained.	●	●	●	●					●	●

Dept	Model name and type	Description	Why model is Business Critical	Summary of QA	Developer Testing	Internal Peer Review	External Peer Review	Use of Version Control	Internal Audit	Quality Assurance Guidelines	External Audit	Governance	Transparency (published results)	Periodic Review
DWP	INFORM amounts and expenditure forecasting model. [Forecasting]	Forecasts benefit expenditure for: - Bereavement Benefits - Carer's Allowance - Disability Living Allowance - Employment and Support Allowance - Housing Benefit for working age people (in development) - Incapacity Benefit - Income Support - Jobseeker's Allowance - Personal Independence Payment - Severe Disablement Allowance - Tax credits (in development) - Universal Credit. Stock based average amounts, drawing on INFORM dynamic microsimulation for qualifying volumes. Outputs expenditure, caseloads, average amounts and flows.	Forecasting benefit expenditure over next few years, essential for fiscal planning and management of government funding. Used to estimate impact of policy decisions worth several hundreds of millions of pounds, or more. Indirectly also influences need to make further policy changes. Assists with planning of workloads and allocations of DEL.	During development model validated against the legacy benefit models. Model outputs regularly tested against out-turn statistical and expenditure data, reviewed and modified as necessary in light of variances and their causes. Outputs scrutinised by OBR and HMT as part of the bi-annual Economic and Fiscal Outlook forecasts, and also by Government Actuary Department (GAD) for contributory benefits. Assumptions consulted on within DWP with policy and delivery experts. An audit trail of changes to assumptions and their impact is maintained.	●	●	●	●			●	●	●	
DWP	INFORM In-house dynamic microsimulation model for forecasting working age benefits and expenditure. [Forecasting]	Models the caseloads on DWP working age benefits at an 'individual unit' level for medium term forecasts (up to ten years). Being updated to include Tax Credits, Housing Benefit and Universal Credit. Models multiple benefit receipt. Combined with separate average amount models to produce expenditure forecasts for major fiscal events (Budget, Autumn statement). Used to inform DWP workload forecasts. Used to inform Universal Credit forecasts and options for migration of legacy caseload.	Used for published DWP forecasts so central to planning of public finances. Significant risk to Government finances over the medium term if forecasts are substantially in error. Reputational risk to Government if forecasts are changed at a late stage due to modelling error. Reputational risk to credibility of DWP (and Government) modelling.	Model outputs are continually tested against out-turn data, and assumptions and methodologies updated to address known variances. Assumptions are consulted on and agreed internally within DWP, with policy and delivery functions, prior to further scrutiny by the Office for Budget Responsibility and HMT.	●	●	●	●	●	●		●	●	●
DWP	In-year forecasting models. [Forecasting]	Forecasts benefit expenditure for all DWP benefits, for the current financial year, on a monthly basis.	Forecasting benefit expenditure over remainder of financial years, essential for management of government funds and Estimates process.	Model outputs regularly tested against out-turn expenditure, statistical and Management Information data, reviewed and modified as necessary in light of variances and their causes. Outputs scrutinised by OBR and HMT on a monthly basis. Validated against medium-term forecasting models.	●	●	●	●				●	●	●
DWP	Maternity benefits forecasting model. [Forecasting]	Forecasts caseloads and benefit expenditure for Statutory Maternity Pay and Maternity Allowance. Inflow-outflow approach - modelling amounts for new awards, changes in status and amounts, and exits from benefit. Outputs expenditure, caseloads and average amounts, and workloads for Maternity Allowance.	Forecasting benefit expenditure over next few years, essential for fiscal planning and management of government funding. Used to estimate impact of policy decisions worth several hundreds of millions of pounds, or more. Indirectly also influences need to make further policy changes. Assists with planning of workloads and allocations of DEL.	Model outputs regularly tested against out-turn statistical and expenditure data, reviewed and modified as necessary in light of variances and their causes. Outputs scrutinised by OBR and HMT as part of the bi-annual Economic and Fiscal Outlook forecasts, and also by Government Actuary Department (GAD) who maintain a parallel model. Assumptions consulted on within DWP with policy and delivery experts. An audit trail of changes to assumptions and their impact is maintained.	●	●	●	●			●	●	●	
DWP	Northern Ireland benefits forecasting model. [Forecasting]	Forecasts caseloads and benefits for all benefits except income-related benefits.	Forecasting benefit expenditure over next few years, essential for fiscal planning and management of government funding.	Model approach defined in a Service Level Agreement. Outputs scrutinised by Northern Ireland Social Security Agency, the customer, and tested against out-turn statistical and expenditure data on a bi-annual basis.	●	●	●						●	
DWP	Other long-term projection models. [Forecasting]	Project expenditure for all non-state pension benefits over 60 years. Outputs caseload and expenditure.	Projecting spending into the long-term. Essential for long-term fiscal sustainability assessments, and impacts of pension and pension age reforms.	Core of model, covering projections of economic activity, developed progressively by HMT, DWP and OBR, with extensive validation. Other elements of the model validated internally. Outputs scrutinised internally by policy analysts, and externally by Government Actuary Department (GAD) and OBR: OBR as part of their annual Fiscal Sustainability Report, GAD for contributory benefits. An audit trail of changes to assumptions and their impact is maintained.	●	●	●	●			●	●	●	●
DWP	Other medium-term forecasting models. [Forecasting]	Forecasts caseloads and benefit expenditure for: - Winter Fuel Payments. - Over 75 TV Licences. - Industrial Injuries Benefits. - Social Fund. - Compensation Recoveries. - Christmas Bonus. - Other benefits not listed elsewhere. Various approaches. Outputs expenditure, caseloads and average amounts, and workloads (though varying between models).	Forecasting benefit expenditure over next few years, essential for fiscal planning and management of government funding. Used to estimate impact of policy decisions worth several hundreds of millions of pounds, or more. Indirectly also influences need to make further policy changes. Assists with planning of workloads and allocations of DEL.	Model outputs regularly tested against out-turn statistical and expenditure data, reviewed and modified as necessary in light of variances and their causes. Outputs scrutinised by OBR and HMT as part of the bi-annual Economic and Fiscal Outlook forecasts. Assumptions consulted on within DWP with policy and delivery experts, and with other Government departments where relevant. An audit trail of changes to assumptions and their impact is maintained.	●	●	●	●				●	●	
DWP	Pension Credit forecasting model. [Forecasting]	Forecasts caseloads, benefit expenditure and workloads for Pension Credit. Inflow-outflow approach - modelling new awards, changes in status, and exits from benefit, and average amounts. Outputs expenditure, caseloads, average amounts, flows and workloads.	Forecasting benefit expenditure over next few years, essential for fiscal planning and management of government funding. Used to estimate impact of policy decisions worth several hundreds of millions of pounds, or more. Indirectly also influences need to make further policy changes. Assists with planning of workloads and allocations of DEL.	Model outputs regularly tested against out-turn statistical and expenditure data, reviewed and modified as necessary in light of variances and their causes. Outputs scrutinised by OBR and HMT as part of the bi-annual Economic and Fiscal Outlook forecasts. Assumptions consulted on within DWP with policy and delivery experts. An audit trail of changes to assumptions and their impact is maintained.	●	●	●	●				●	●	●
DWP	State Pensions forecasting model [Forecasting]	Forecasts caseloads, benefit expenditure and workloads for State Pension (both Basic State Pension and Additional Pension (SERPS / S2P). Inflow-outflow approach - modelling amounts for new awards, changes in status and amounts, and exits from benefit. Outputs expenditure, caseloads, average amounts, flows and workloads.	Forecasting of benefit expenditure over next few years, essential for fiscal planning and management of government funding. Used to estimate impact of policy decisions worth several hundreds of millions of pounds, or more. Indirectly also influences need to make further policy changes. Assists with planning of workloads and allocations of DEL.	Model outputs regularly tested against out-turn statistical and expenditure data, reviewed and modified as necessary in light of variances and their causes. Outputs scrutinised by OBR and HMT as part of the bi-annual Economic and Fiscal Outlook forecasts, and also periodically by Government Actuary Department (GAD) who maintain a parallel model. Assumptions consulted on within DWP with policy and delivery experts. An audit trail of changes to assumptions and their impact is maintained.	●	●	●	●			●	●	●	●

Dept	Model name and type	Description	Why model is Business Critical	Summary of QA	Developer Testing	Internal Peer Review	External Peer Review	Use of Version Control	Internal Audit	Quality Assurance Guidelines	External Audit	Governance	Transparency (published results)	Periodic Review
DWP	Statistical projections of future annual deaths from the asbestos related cancer mesothelioma. [Forecasting]	Estimates the annual number of mesothelioma deaths as a consequence of asbestos exposures before 1980 and an assumed pattern of asbestos exposure after 1980. The main reason for the projections is to predict when the peak in mesothelioma deaths will occur since annual deaths continue to rise currently as a consequence of widespread asbestos use in the 1960s and 1970s in Britain. A further aim is to understand the relationship between asbestos exposure and mesothelioma risk at the population level that will provide insights to help HSE in its role of preventing asbestos related disease. However, the statistical model can also be used to predict longer term trends based on assumptions about more recent asbestos exposures although the uncertainties are considerable.	Although not the main focus of why HSE produced the projections, the longer term predictions have been of interest to a number of stakeholders and have informed important financial decisions, including: Use by the Institute of Actuaries Asbestos Working Party to guide decisions about reserves needed by UK insurance industry to cover civil compensation pay outs to victims of asbestos related diseases. (The Working party has also alternative projections by Prof Julian Peto.) Use by DWP to inform costs of the new scheme of last resort, funded by the insurance industry, to allow those with mesothelioma but who cannot trace the responsible employer and employer's insurer to claim compensation. NOTE: the statistical uncertainties in the long term projections have been strongly emphasised by HSE in both cases.	The model was developed internally by Health and Safety Executive (HSE) statisticians using standard statistical techniques and official statistics on mesothelioma deaths and British population data. It was replicated by a separate team of statisticians in the Health and Safety Laboratory (HSL) and two alternative models developed by HSL give similar results. The main model has been externally peer reviewed and published in the scientific literature. It has received additional detailed scrutiny by the Institute of Actuaries Asbestos Working Party.	●	●	●	●				●	●	●
DWP	Local Authority administrative subsidy model. [Allocation]	Distributes HB admin subsidy to the 380 Local Authorities.	Support to Local Authorities. Drives funding decisions as model is used to distribute the HB Admin subsidy to the 380 Las.	The HB Administration Subsidy allocation model is used annually to allocate this grant to all 380 Local Authorities. The allocation methodology is regularly reviewed and updated to ensure fitness for purpose over the model lifetime. The model is updated each year with latest available data. Inputs and outputs are tested throughout the allocation process to ensure these are sensible and consistent. Each year the inputs and methodology are consulted on and agreed internally with policy and delivery functions, prior to further scrutiny by the Local Authority Association Steering Group. The final allocations are first approved by the Minister via a formal submission process before final allocations are shared with Local Authorities and published on the DWP Website.	●	●	●	●				●	●	●
DWP	Child Maintenance Corporate Planning Model. [Planning]	Supports CMG / Child Maintenance Reform business case. Calculates Strategic funding and resource requirement for CMG to 20/21. Used for scenario development / policy decision support / cost sensitivities / benefits realisation / high level volumetrics.	Informs / supports Policy decision making and related outputs (eg:CMG Charging and Case Closure Impact Assessment August 2012;) Underpins CMG long term business planning. Informs affordability planning, CMG funding settlement, resource requirements, long term cost/revenue projections. Main evaluation tool for alternative delivery scenarios / options.	The model is regularly updated with actual performance data; assumptions are consulted on and agree internally within DWP; the model's outputs are reviewed by internal DWP stakeholders. The model outputs, assumptions and methodologies are subject to audit reviews internally within DWP and have been reviewed by the National Audit Office (NAO).	●	●	●	●	●		●	●		●
DWP	Universal Credit Forecasting and Planning Model. [Planning]	Calculates potential workloads for Universal Credit including: 1) High Level Intake e.g. new claims, awards, migrations; 2) Build-up of Universal Credit caseload, and rundown of legacy caseloads i.e. DWP benefits, Tax Credits, Housing Benefit; 3) Shutdown of legacy benefits and tax credits; 4) Volume of interactions with customers, and volumes of business processes.	The volumetrics are a key driver of the Departmental model used to calculate Full-Time Equivalent (FTE) staff required to deliver Universal Credit.	The volumetrics model draws heavily on the Department's Integrated Forecasting Model (INFORM) for Universal Credit. INFORM is documented in a separate return. Wider QA of volumes includes developer testing, peer review, version control, and agreement of key design assumptions with UC stakeholders.	●	●		●	●			●		●
DWP	Pension Credit Plus whole workloads model, internally developed spreadsheet model. [Planning]	Calculates the benefit caseload profile for Pension Credit Plus - following the migration of Housing Benefit into Pension Credit.	Influences decisions around resource allocation and IT and delivery capacity for the Pension Service when Housing Benefit is brought into DWP.	The models have undergone user and peer reviews. Outputs are tested against up to date data and assumptions and methodologies updated to address known variances. Assumptions are consulted on and agreed internally within DWP, with policy and delivery functions.	●	●		●						●
DWP	Universal Credit conditionality additional costs and volumes model. [Policy Simulation]	Calculates the costs of delivering labour market interventions to Universal Credit customers and number of Jobcentre Plus Full-time equivalents. Profiles the volumes of people in different conditionality groups, including those groups brought into conditionality by Universal Credit.	It helps the Department to understand its overall funding position and the headcount resources it need to deliver.	This model is used to understand the numbers of people who will be recipients of DWPs work services when Universal Credit is introduced. This includes the volumes, costs and potential savings of delivering this support, including how many will be sent on contracted provision (for example the Work Programme). This enables us to analyse the cost and impacts of changes to the regime of labour market support offered under Universal Credit.	●	●		●						
DWP	Bereavement Benefits reform costing model. [Policy Simulation]	Calculates Bereavement Benefit expenditure under reform: (1) future AME spend, that is payments under reformed Bereavement Benefits, Universal Credit and Legacy Protections (accrued rights to legacy bereavement benefits); and (2) tax foregone, that is tax not claimed on Universal Credit that would have gone to HMRC on ongoing regularly paid legacy benefits.	The model is business critical because it drives AME expenditure decisions, and possibly DEL spending in the future. It provides the basis for CBA and winners-and-losers analysis, giving assurance on financial and legal challenges from inside and outside government.	This ranges from sense checking high-level outturns to detailed quality assurance of model processes. The peer reviewer looks for any calculation errors made by the developer; while the developer and dual checker also look for this post development and for possible assumption and methodological improvements. Some aspects are consulted on and agreed internally within DWP with policy and delivery functions, prior to scrutiny by the OBR and HMT/HMRC.	●	●	●	●				●	●	●
DWP	Fraud & Error Cost Benefit analysis models: A series of different models, developed to evaluate the likely AME savings from each of the fraud and error initiatives included in the F&E Change Programme. [Policy Simulation]	Provides estimates of the financial savings we would expect from each of the F&E initiatives.	Key in understanding the business case for each of the F&E initiatives incorporated in the Strategy and for informing the best design of the initiatives, to maximise VfM.	The models are developed by analysts working closely with the relevant policy leads, who provide regular sense checks of the results. Finance colleagues have also reviewed the models to ensure they understand the sources of the savings.	●	●				●				
DWP	Future Overpayment Prevented AME savings model: estimates impacts on AME expenditure. [Policy Simulation]	Estimates the AME impact of identifying cases of incorrect benefit payment. Inputs include the weekly value of overpaid and underpaid benefit that have been/likely to be identified. Calculates the AME savings to the Department arising from identifying and stopping the incorrect payments.	Model is used to monitor the VfM of our fraud and error initiatives and the expected impact on Departmental AME expenditure. Influences decisions on DEL funding for those initiatives.	The methodology and spreadsheets have been audited by internal auditors. The methodology is regularly challenged, reviewed and updated to reflect the latest understanding of how the identification of overpayments impacts on AME expenditure.	●	●				●				
DWP	Mesothelioma Payment Scheme. [Policy Simulation]	Collates forecasts of deaths from Mesothelioma, applies impact assessment assumptions to estimate forecasts of number of cases eligible for the new Mesothelioma Payment Scheme. Calculates financial costs to insurance industry and full costs and benefits to the main affected groups to inform the impact assessment for the new Mesothelioma Payment Scheme Bill.	Drives key funding decisions - e.g.. the levy insurers will pay. Under-pins the impact assessment for new legislation.	The model is designed to calculate financial costs to insurance industry and full costs and benefits to the main affected groups to inform the impact assessment for the new Mesothelioma Payment Scheme Bill. The model collates forecasts of deaths from mesothelioma, applies impact assessment assumptions to estimate forecasts of number of cases eligible for the new Mesothelioma Payment Scheme. The model has been subject to a wide range of quality assurance, including both internal and external peer review.	●	●	●	●		●		●	●	●

Dept	Model name and type	Description	Why model is Business Critical	Summary of QA	Developer Testing	Internal Peer Review	External Peer Review	Use of Version Control	Internal Audit	Quality Assurance Guidelines	External Audit	Governance	Transparency (published results)	Periodic Review
DWP	Pensim2. In-house dynamic microsimulation model for policy simulation [Policy Simulation]	Models the incomes of pensioners at the 'benefit unit' level through to 2100. Includes modelled entitlement to State Pension, private pension and pensioner income-related benefits. Produces distributional impacts of reforms. Estimates the cost and impact of changes to pensions policy. Used to estimate trends in expenditure of pensioner income-related benefits over the long term. Used to perform sensitivity analysis of policy outcomes to underlying assumptions (e.g. population projections).	Used to estimate the cost and distributional impact of high profile reforms to State and private pensions. Allows analysis of the 'adequacy' of pensions under reforms. Significant risk to Government finances over the long run if estimates of the cost of reforms are substantially in error. Significant risk to Government finances over the long run if estimates of the trends in expenditure of pensioner income-related benefits are substantially in error. Reputational risk to Government if reforms are changed at a late stage due to modelling error. Reputational risk to credibility of DWP (and Government) modelling.	Pensim2 has been subject to two major reviews; one undertaken by the Institute for Fiscal Studies, the other by John Sabelhaus (Unit Chief for Long-Term Modelling, Congressional Budget Office, US). Overall direction of development of the model determined by a 'Steering group' of senior stakeholders. Regular users of the model meet monthly to discuss details of development, prioritisation of changes and other day-to-day issues of running the model. New modelling is signed-off by policy analysts before being built into the released version of the model.	•	•	•	•		•	•	•	•	•
DWP	Pension Credit / Universal Credit policy modelling, a number of combined spreadsheets developed internally. [Policy Simulation]	Calculates the benefit expenditure (AME) impacts of changes to Pension Credit and Housing Benefit following the introduction of Universal credit and the migration of HB into DWP.	Influences key policy decisions and forecasted benefit expenditure.	The models have undergone user and peer reviews. Outputs are tested against up to date data and assumptions and methodologies updated to address known variances. Assumptions are consulted on and agreed internally within DWP, with policy and delivery functions.	•	•	•	•					•	•
DWP	Pension Credit Uprating model, internally developed simple spreadsheet model for assessing policy options. [Policy Simulation]	Calculates the benefit expenditure (AME) on Pension Credit and knock on impacts to Housing Benefit for different uprating options for Pension Credit.	Key decisions on how to uprate a social security benefit, and therefore forecasted benefit expenditure.	The models have undergone user and peer reviews. Outputs are tested against up to date data and assumptions and methodologies updated to address known variances. Assumptions are consulted on and agreed internally within DWP, with policy and delivery functions.	•	•	•	•					•	•
DWP	Policy Simulation Model - Universal Credit version. [Policy Simulation]	Simulates a welfare system including Universal Credit to enable a comparison with the current benefit system and estimate the additional AME cost of UC. Assesses the impact of policy change at an individual level to explore work incentives, poverty, gainers / losers, distributional impacts etc. We make various adjustments to capture elements not otherwise fully within the PSM e.g. the self-employed within UC, modelling the transition to Universal Credit (these use a combination of the UC-PSM and other e.g. Excel models).	Drives key funding decisions and policy development.	QA processes as per core Policy Simulation Model (PSM). Internal and external scrutiny e.g. OBR, HMT, HMRC.	•	•	•	•	•				•	•
DWP	Policy Simulation Model (PSM) - static micro simulation model of the tax and benefit system based on survey data, developed and updated in-house. [Policy Simulation]	Based on survey data from the Family Resources Survey (FRS) showing income details at household level. Models the effect on households of various actual and potential changes to welfare and tax credits policies. Estimates numbers of households affected and amounts affected by. Provides policy expenditure estimates up to 2020/21.	Used to estimate the cost and distributional impact of high profile reforms to working age and pensioner benefits, including flagship government policies such as Universal Credit. Significant risk to Government finances over the long run if estimates of the cost of reforms are substantially in error. Significant risk to Government finances over the long run if estimates of the trends in expenditure of income-related benefits are substantially in error. Reputation risk to Government if reforms are changed at a late stage due to modelling error. Reputation risk to credibility of DWP (and Government) modelling.	Model outputs from each new version (release) are tested by both the development team itself and analysts in the lead policy area's) for whom the release was developed. Assumptions are agreed between the development team and lead policy area's) and are also signed off by the OBR where they affect Budget and Autumn Statement castings. Significant reconciliation work with an HMT tax-benefit model (called IGOTM) was undertaken in May 2011 to bring Policy Simulation Model (PSM) and IGOTM assumptions and outputs into closer alignment.	•	•	•	•	•	•		•	•	•
DWP	Recovery rates model: identifies the amount of Universal Credit (UC) benefit we could deduct each month as recovery of a previous overpayment, given the other sources of debt that are also recoverable from benefit payments. [Policy Simulation]	Model considers the amounts of each type of debt that could be recovered from benefit payments, compared to the amounts of the benefit payments. Provides an understanding of the consequences of setting various levels of monthly recovery.	Outputs were key in making decisions on the levels of debt recovery for UC and in getting agreement from HMRC that they would not lose out financially by handing over their Tax Credits debts to DWP.	The model was developed by an analyst who then took policy colleagues from both DWP and HMRC through it line by line to ensure they agreed with the underlying thinking and understood and agreed its conclusions.	•	•	•							
DWP	State Pension reform model - policy simulation/projection. [Policy Simulation]	The model estimates the impact of various policy changes compared to the current Pension System - and produces estimates of expenditure and impact of policies on individuals. The key outputs from the model will feed into the proposed White Paper/Impact Assessment.	High profile policy initiative with public commitments.	The model has been peer reviewed internally within DWP and externally audited by the Government Actuary's Department (GAD) who undertook a substantial audit in early and in January 2013 quality assured latest outputs from model ahead of white paper publication.	•	•		•			•	•		
DWP	Support for mortgage interest (SMI): Capital limit and waiting period model. [Policy Simulation]	From January 2009, the SMI waiting period was reduced from 39 weeks to 13 weeks and the capital limit was increased from £100,000 to £200,000 for all new working age claims. The model estimates the annual cost of maintaining (to a chosen end date) a shorter waiting period and higher capital limit (compared to a baseline position of 39 weeks waiting period and £100,000 capital limit coming into effect in January 2013). It is possible to select different combinations of waiting periods and capital limits. The model also provides estimates of the number of claimants who would benefit from the policy.	The estimated costs from this model feed into funding decisions around the affordability of maintaining a higher capital limit / shorter waiting period (than the baseline).	The model was internally peer reviewed, including by a senior colleague. Developer testing of the model included clarification and, where appropriate, refinement of key assumptions and uncertainties; these were documented and shared with HMT and the Office for Budget Responsibility for their scrutiny. Version control between models has been maintained and the estimated policy costs from the latest version have been published on HMT's website.	•	•	•	•				•	•	•
DWP	UC Migration model. [Policy Simulation]	Creates a managed migration profile.	Supports decisions around launch and migration strategy for UC.	The migration model forms part of wider suite of tools used to assess the overall cost and impact of rolling out Universal Credit. The migration model is used to identify viable strategies to move claimants from existing benefits to Universal Credit through an iterative process to fine tune individual options. Strategies identified as being viable are then fully impacted via the other tools. Version control is a key QA consideration given the integrated nature of option development and assessment as it's essential that the migration model mirrors the caseload, rollout and claimant behaviour assumptions within INFORM. Therefore to ensure the subtleties of each new scenario are fully captured the inputs are examined for consistency (with INFORM and strategy) and that outputs look sensible/intuitive.	•	•	•	•						
DWP	Universal Credit Business Case. [Policy Simulation]	Calculates the economic and financial case for Universal Credit and assesses whether Treasury affordability criteria are satisfied to feed into the UC Business Case.	High profile policy - the delivery of Universal Credit is Strategic Reform Priority 1 for DWP and is the centre piece of the Government's policy on Welfare Reform. UC Business Cases formally request funding for next phases of implementation.	Developer testing, peer review, version control, internal audit, external audit.	•	•	•	•			•	•		•
DWP	Universal Credit Fraud and Error model: A list of the various consequences UC is expected to have on fraud and error. [Policy Simulation]	Provides estimates of the financial savings we would expect from reductions to F&E due to UC.	Key in informing the business case for UC.	The model is regularly reviewed and updated as the details of UC become clearer, with input from HMRC colleagues on elements relevant to Tax Credits. The complex elements of the model has been carefully reviewed by other analysts within DWP. Other senior DWP analysts and finance colleagues, as well as the OBR, have been talked through the broad stages of the analysis and have sense checked the results.	•		•	•	•					

Dept	Model name and type	Description	Why model is Business Critical	Summary of QA	Developer Testing	Internal Peer Review	External Peer Review	Use of Version Control	Internal Audit	Quality Assurance Guidelines	External Audit	Governance	Transparency (published results)	Periodic Review
DWP	Commercial Operating Model. [Procurement & Commercial]	The Operating Model describes how the commercial community will manage it's business in support of meeting DWP Business Objectives and is formed around the commercial organisation utilising the Category Management toolkit in collaboration with other functions and departments within DWP. This can be translated into the who (Organisation) does what (the Category Management approach) and how (new collaborative ways of working) in terms of operational activity and support within DWP and beyond.	Supports consideration of approach and decision making.	Peer review, Version control. Further review /development via the Commercial Policy Team and related forums (e.g. Procurement Policy Forum).		●		●						
DWP	Contestability Assessment Model. [Procurement & Commercial]	A report with recommendation about the best VFM service delivery option.	Drives make or buy decisions for key services.	Contestability policy and process approved and reviewed by senior management and project governance. Model development and application assured by commercial team and business managers.		●		●		●			●	
DWP	Financial Viability and Risk Assessment (FVRA). [Procurement & Commercial]	The model tests the financial viability of suppliers and trends in financial performance. It is applied monthly and generates a RAG rating for the supplier to inform bid evaluations and contract and supplier management activity.	Provides information for the final contract.	Peer review and sourcing project governance.		●							●	
DWP	MEAT - Most Economically Advantageous Tender Model - a recognised Procurement Model used for under and over the Official Journal of the European Union (OJEU) thresholds. [Procurement & Commercial]	Calculates if VfM and affordability criteria are satisfied for each procurement. It has a quality and cost threshold which is adjusted to take account of specific HSE business requirements. Calculates over whole of contract life.	Could engender financial and reputation damages should the outcome of the procurement exercise be subject to a legal challenge.	Pre-tender, the model is developed and quality assured in consultation with the customer to ensure it is fit for purpose in the context of the specific business requirement. In addition, at tender stage, bidders have the opportunity to comment on the application and suitability of the model in the context of the bidding and subsequent evaluation process.	●	●	●		●			●	●	●
DWP	Procurement VFM measurement. [Procurement & Commercial]	Procurement savings and VFM improvements by type and category.	Drives resource decisions and demonstrates value of procurement function.	Validation of Category Team reports by Finance Business Partner and central procurement team. Annual internal audit of results.	●	●	●	●	●	●		●		●
DWP	The Sustainable Procurement Risk Assessment (SPRAM). [Procurement & Commercial]	The Sustainable Procurement Risk Assessment Methodology (SPRAM) is a tool that is used to identify potential sustainable procurement related risks and opportunities that may exist during a procurement or life of a contract. Use of the tool is mandatory for all procurements in DWP and it should also be used at a review point during the life of the contract. SPRAM covers the 3 keys aspects of sustainability - social, economic and environmental factors. Completing the tool helps commercial staff to identify any potential sustainability related risks and requires users to try and document what mitigation action will be taken to try and reduce the risk. It provides an audit trail for Commercial Assurance and RAD if required. Key Government policy areas such as SMEs, apprenticeships and carbon reduction are covered in SPRAM.	The Sustainable Procurement Risk Assessment Methodology (SPRAM) is a tool that is used to identify potential sustainable procurement related risks and opportunities that may exist during a procurement or life of a contract.	Peer review and sourcing project governance.		●	●					●		
DWP	EUSES v2.1.2 (European Union System for the Evaluation of Substances) Science based model developed by the European Commission. [Science-Based]	Estimates predicted environmental concentrations of biocidal active substances in soil, surface water, sediment, groundwater and air.	The model is a critical tool in the chemical substance evaluation process. The outputs can influence the registration status of individual biocidal products or of an active substance, either at UK and/or EU level.	Developed at EU level, subject to EU peer review and version control.	●	●	●	●	●	●	●	●	●	●
DWP	FOCUS Groundwater Scenarios Science-based predictive model. Out-sourced. [Science-Based]	Used in regulatory decision-making for plant protection product authorisation. Model is used at the first tier of a tiered assessment to predict potential for contamination of shallow groundwater by pesticides and associated breakdown substances for comparison to EU drinking water standards, e.g. 0.1 μg/l.	Predicted concentrations form part of overall regulatory decision on individual plant protection products. Pesticides and toxicologically relevant breakdown products predicted to exceed EU drinking water standard in the first tier model cannot be authorised unless higher tier evidence of low risk of groundwater contamination can be presented.	Developed at EU level, subject to EU peer review and version control.	●	●	●	●	●	●	●	●	●	●
DWP	FOCUS Surface Water Scenarios Science-based predictive model. Out-sourced. [Science-Based]	Used in EU regulatory decision-making for plant protection product authorisation. Model is used at the first tier of a tiered assessment to predict potential for contamination of small surface water bodies (ditches, streams and ponds) adjacent to agricultural fields by pesticides and associated breakdown substances. Results of predicted exposure are subsequently used with ecotoxicological data on aquatic organisms in a structured risk assessment procedure.	Predicted concentrations form part of overall regulatory decision on individual plant protection products. Pesticides and breakdown products predicted to present an unacceptable risk to aquatic organisms in the first tier model cannot be authorised unless higher tier evidence of low risk to aquatic organisms can be presented.	Developed at EU level, subject to EU peer review and version control.	●	●	●	●	●	●	●	●	●	●
DWP	FOCUS_DEGKIN. Science-based model. Out-sourced. [Science-Based]	Used in EU and UK regulatory decision-making for plant protection product authorisation. Model is used to determine degradation rates of substances in the soil or water. These degradation rates are subsequently used as input parameters in previously cited models to derive predicted environmental concentrations.	Degradation rates are critical information used in risk assessment procedures and predictive models can be highly sensitive to degradation rates.	Developed at EU level, subject to EU peer review and version control.	●	●	●	●	●	●	●	●	●	●
DWP	HardSPEC Science-based predictive model. Out-sourced. [Science-Based]	Used in UK regulatory decision-making for plant protection product authorisation. Model is used at the first tier of a tiered assessment to predict potential for contamination of small surface water bodies (streams and ponds) adjacent to urban areas or roads by pesticides used on hard surfaces. Results of predicted exposure are subsequently used with ecotoxicological data on aquatic organisms in a structured risk assessment procedure.	Predicted concentrations form part of overall regulatory decision on individual plant protection products. Pesticides and breakdown products predicted to present an unacceptable risk to aquatic organisms in the first tier model cannot be authorised unless higher tier evidence of low risk to aquatic organisms can be presented.	Model development overseen by steering committee of internal and external stakeholders.	●	●	●	●	●	●		●		●
DWP	MAMPEC v2.5 Science based model developed by the European Council of the Paint, Printing Ink and Artists' Colours Industry (CEPE). [Science-Based]	Estimates predicted environmental concentrations of antifouling paint biocidal active substances in surface water and sediment based on standard EU level scenarios.	The model is a critical tool in the chemical substance evaluation process. The outputs can influence the registration status of individual biocidal products or of an active substance, either at UK and/or EU level.	Developed at EU level, subject to EU peer review and version control	●	●	●	●		●			●	
DWP	National Estimates of Daily Intakes (NEDI) used to assess long-term dietary risks from pesticide residues. [Science-Based]	Provides an estimate of long term exposure of consumers from pesticide application. This value (expressed as mg/kg bw/day) is compared to the critical reference dose of the active substance contained in the pesticide product. If the exposure value is less than the reference value, approval can be recommended, if it is more, then higher tier data/information is required to help refine the assessment.	Failure of the assessment using the model can (but not always) result in lack of opportunity to enter market or in further expense to industry in employing or generating higher tier data to demonstrate an acceptable level of risk.	Spreadsheet implementing methodology set out in the UN's Food and Agriculture Organization Manual on the Submission of Pesticide Residues Data, 2002, as modified by the former UK Ministry of Agriculture, Forestry and Fisheries (MAFF) and endorsed by the Food Standards Agency using UK food consumption data provided by the Food Standards Agency. Internal and external peer review procedures apply.		●	●	●					●	●
DWP	National Estimates of Short Term Intakes (NESTI) used to assess acute dietary risks from pesticide residues. [Science-Based]	Provides an estimate of acute exposure of consumers from pesticide application. This value (expressed as mg/kg bw/day) is compared to the critical reference dose of the active substance contained in the pesticide product. If the exposure value is less than the reference value, approval can be recommended, if it is more, then higher tier data/information is required to help refine the assessment.	Failure of the assessment using the model can (but not always) result in lack of opportunity to enter market or in further expense to industry in employing or generating higher tier data to demonstrate an acceptable level of risk.	Spreadsheet implementing methodology set out in the UN's Food and Agriculture Organization Manual on the Submission of Pesticide Residues Data, 2002, as modified by the former UK Ministry of Agriculture, Forestry and Fisheries (MAFF) and endorsed by the Food Standards Agency using UK food consumption data provided by the Food Standards Agency. Internal and external peer review procedures apply.		●	●	●					●	●
DWP	Predictive Operator Exposure Model aka POEM (and other generic models used to assess the risk to operators, workers and bystanders from the use of plant protection products). [Science-Based]	Provides a conservative first tier estimate of exposure to operators from pesticide application. This value (expressed as mg/kg bw/day) is compared to the critical reference dose of the active substance contained in the pesticide product. If the exposure value is less than the reference value, approval can be recommended, if it is more, then higher tier data/information is required to help refine the assessment.	Failure of the first tier assessment using the model can (but not always) result in further expense to industry in employing or generating higher tier data to demonstrate an acceptable level of risk.	Data underpinning the model were subject to full scientific scrutiny and approved by the independent Scientific Sub Committee and the Advisory Committee on Pesticides. Internal and external peer review process of model outputs.		●	●	●					●	●

Dept	Model name and type	Description	Why model is Business Critical	Summary of QA	Developer Testing	Internal Peer Review	External Peer Review	Use of Version Control	Internal Audit	Quality Assurance Guidelines	External Audit	Governance	Transparency (published results)	Periodic Review
DWP	REMA Science based model developed by HSE and the UK Environment Agency. [Science-Based]	Estimates predicted environmental concentrations of antifouling paint biocidal active substances in surface water and sediment based on UK specific scenarios.	The model is a critical tool in the chemical substance evaluation process. The outputs can influence the registration status of individual biocidal products or of an active substance, either at UK and/or EU level.	Developer testing, Peer review. Considered by the independent Advisory Committee on Pesticides in use.	●	●	●					●	●	●
DWP	RISKAT Science based model - in house. ** this is an example of a Land Use Planning Model, there are a number of other models that deal with other aspects of land use planning these are subject to the same assurance mechanisms details are in the attached document. [Science-Based]	RISKAT predicts individual risk of exposure to a toxic gas following an accidental release. The model takes the outputs from gas dispersion models together with weather data and calculates individual risk contours. The outputs are numerical values of individual risk in a geo referenced format which can be produced as risk grid values or risk contours.	RISKAT is HSE's main calculation platform for producing risk-based consultation zones around major accident hazard sites. This information is used to provide public safety advice around existing sites and to provide advice on new hazardous substances consent or variations to existing consents. The platform has recently been updated to improve the efficiency of the risk calculation process and to allow the incorporation of new science.	Health and Safety Executive's (HSE) QA procedures incorporate an appropriate mix of developer testing, internal and external peer review, version control, project board governance publication of the science and periodic fundamental review. HSE restricts the use of its models to appropriately trained staff working in a peer-review environment. The models are based on available sound science that has been published in the peer-reviewed scientific literature. Specific peer review by industry experts is also used during the development of an assessment method. The results of predictive models are validated against available data sets from experimental trials, and the outputs of models are compared to other industry standard models. The software code is written to quality assured procedures. When models are updated, they are extensively tested by scientific staff at the Health and Safety Laboratory. Where models produced by external providers are used, they are also subjected to extensive testing before they are used.	●	●	●	●		●	●	●	●	●
DWP	Uprating costs model. [Policy Simulation]	Calculates the cost of uprating benefits, or parts of benefits, by different amounts.	Key decisions on how to uprate a social security benefit, and therefore forecast benefit expenditure.	Model is based on the Forecasting Division's economic assumptions ready reckoner underpinned by the Department's suite of forecasting models. Similar to these forecasting models; outputs from the uprating cost model are scrutinised against outturn, internally audited by the Forecasting Division and users and externally audited by OBR and HMT.	●	●	●	●						●
DWP	Volumetrics Model. [Planning]	Utilises Volumes Forecast, Volumetric Assumptions and Productivity Timings to calculate FTE requirement.	Drives key Operational Decisions. Used to inform DEL expenditure in Business Case.	Volumes and assumptions underpinning the modelling are refreshed in line with the most recent forecasts. Prior to the baselining of the model the volumes and assumptions are reviewed and signed off by internal strand leads across the programme. Version control is used to differentiate against changes to the original model. When the model has been signed off internally it is shared with Internal Audit as part of the Business Case review process.		●		●	●					
DWP	Business Case Cost Model - Personal Independence Payment Implementation Programme. [Financial Evaluation]	Incorporates volumetrics modelling, AME modelling and Other Costs to produce VfM, Affordability, DCF & all other FBC values.	Lynchpin for Business Case. Drives all figures within the FBC.	Volumes and assumptions underpinning the modelling are refreshed in line with the most recent forecasts obtained from Finance Business Partners and Analysts. Prior to the baselining of the model the volumes and assumptions are submitted for stages of review by internal strand leads across the programme. Version control is used to differentiate against changes to the original model and step changes from original version illustrated. When the model has been signed off internally it is shared with Internal Audit as part of the Business Case review process.		●		●	●	●				
DWP	Social Fund Forecasting Model Version 10. [Forecasting]	Forecasts expenditure and recoveries of Crisis Loans and Budgeting Loans. This information is then used to inform workload forecasts and policy decisions on Crisis Loan scheme and the maximum amount people can borrow from the budgeting loan scheme.	This drives key funding decisions for the Social Fund and its effective management and operational delivery.	This model is reviewed on a regular basis by members of the social fund team and cross checked by the team leader. In addition it was recently fully reviewed by a new team members who made some improvements to the model improving its accuracy . This means that the model has been fully reviewed and updated in the past three months. In addition to the comprehensive checks within the team the model and outputs are checked by policy colleagues and the Department's Forecasting Division.	●	●		●		●			●	●
DWP	Autumn statement forecasting model. [Forecasting]	Provides forecasts for the regulated and discretionary social fund to inform the autumn budget statement.	The total spend was required for funding and finance in line with yearly government budgets.	This is reviewed within the team on a regular basis and recently it was fully reviewed by a new team members who made some improvements to the model. This indicates it has been fully reviewed and updated. The output is senses checked by policy colleagues and the Departments Forecasting Division.	●	●		●		●			●	●
DWP	Regulated fund model. [Policy Simulation]	This is not a specific model but rather a series of outputs from the Department's Policy Simulations Model which are linked together.	This has informed decisions into the reform of Cold Weather Payments, Funeral Payments and Sure Start Maternity Grants and the integration into Universal Credit.	The model was reviewed by the team leader and by Universal Credit analysts who improved the coding.	●	●	●	●		●				●
DWP	Localisation Model. [Planning]	This is not a specific model but rather a series of outputs from the Department's Social Fund Computer System, which are then collated into a large Excel spreadsheet, and used to calculate local authority AME and DEL allocations.	This is used to allocate funding to Scotland, Wales and English Local Authorities for the delivery of local welfare provision.	This has been regularly reviewed within the team on a regular basis and recently it was fully reviewed by a new team members who made some improvements to the model.	●	●		●		●			●	
DWP	Jobseeker's Allowance Channel Shift Model. [Planning]	Forecasts proportions claiming Jobseeker's Allowance online.	DWP has set a target of 80% new claims to be made online. This model helps inform decision making involved in hitting that target.	Model outputs are continually tested against out-turn data, and assumptions and methodologies updated to address known variances. Assumptions are consulted on and agree internally within DWP.	●	●		●						●
DWP	Universal Credit Channel Shift Model. [Planning]	Forecasts proportions claiming Universal Credit online.	Helps inform targets for uptake of Universal Credit online.	Model outputs are continually tested against out-turn data, and assumptions and methodologies updated to address known variances. Assumptions are consulted on and agree internally within DWP.	●	●		●						●
DWP	Business Case Cost Model - Universal Credit Implementation Programme. [Planning]	Incorporates volumetrics modelling, AME modelling driven from INFORM, and additional modelling of DEL costs specifically around Operations/Legacy rundown and Other Costs to produce VfM, Affordability, DCF & all other FBC values. Produces FTE position to feed into Target Operating Model.	Lynchpin for Business Case. Drives all figures within the FBC.	Peer review, version control, internal audit, change finance challenge review.		●		●	●	●				
DWP	Pricing Proposal Model used to evaluate bids submitted in the commercial contract letting process. N.B. This model is a process tool to allow for tender evaluations rather than a model that holds information and allocates funding. Each model is individual and will be tailored to each procurement let. [Procurement & Commercial]	Provides completed supplier cost base for contract delivery. Calculates supplier revenue/cash flow/break-even points forecasts from respective contracts. Calculates expected total and annual contract values at contract award stage.	Regularity requirement to ensure that all tenders are evaluated equitably and fairly in line with contract law/EU directives/commercial policy.	A standard model exists and is used consistently across all evaluations. Any amendments to the model are undertaken on an individual specific basis related to the requirements of each procurement and any subsequent changes are version controlled. Peer review is undertaken to check that the model is fit for purpose before issuing to the market as part of the invitation to tender package. All models are available for internal audit review. External scrutiny has been applied to the model on previous high value/high risk projects by independent external consultants as part of the procurement process.		●	●	●	●			●		●
FCO	ICT Reprocurement Programme - VFM and affordability model supporting the Programme Outline Business Case (OBC). [Procurement & Commercial]	Appraises VFM and affordability for each of the options presented in the OBC. Calculates NPV for each of the economic options. Assesses resource and capital affordability for the preferred options.	OBC approval was required to launch ICT reprocurement which was business critical to replace expiring contracts.	Developer testing, peer review, external peer review, version control	●	●	●	●						

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FCO	UK Export Projections. [Forecasting]	FCO Economics Unit has created projections of import demand for different economies around the world to 2020, based on IMF estimates. These are mapped alongside projections of current UK market share, and potential increase in market share, if the UK were to match an average of that held by France, Germany and Italy (as our closest comparators). These projections are then used to demonstrate the increase in exports that would need to occur, particularly in emerging markets and eastern Europe, to achieve the aspiration set by HMT of £1tr in exports by 2020.	The projections in themselves are not business-critical. But, as agreed the joint FCO/UKTI Board, they will be used as a reference point for embassies to evaluate their performance in raising UK exports. In addition, they have been used as background analysis to inform decisions on deployment of resources within the network.	Developed by FCO Economics Unit. Discussed by Chief Economist with peers in Govt Economics Service, and team has compared IMF projections with analysis by external consultancy Oxford Economics. Project has identified a number of caveats (e.g. fluctuation in estimates of future global growth rates), which are clearly highlighted in presenting work to non-specialist audiences.		•	•						•	•
FSA	Charge rate calculation. [Financial Evaluation]	Calculates Meat Official Controls hourly charge rates required to recover budgeted costs over budgeted hours. Discounts are then applied.	Required to calculate amounts to be invoiced to customers.	External audit annually prior to advising stakeholders of rates to apply in forthcoming financial year, peer review, internal audit, version control.	•	•		•	•		•	•	•	•
FSA	Review of Delivery of Official Controls - LA food budget and expenditure projections model. [Policy Simulation]	Evaluates and projects the costs of the current model of food safety official controls delivery by Local Authorities to monitor resources for food safety and inform an assessment about the sustainability and resilience of the current model of official control delivery.	Essential to the achievement of business plan and strategic plan priorities. Underpins FSA obligation as Central competent authority for food and feed safety.	Developer testing; Peer Review; version control; publication.	•	•		•				•	•	•
FSA	A new approach to charges for official controls on meat: delivering efficiency and reform - Modelling of costs and benefits [Policy Simulation]	Appraises the costs and benefits of alternative full cost recovery models of official controls in meat hygiene delivery in order to inform decisions about moving to full cost charging.	Required to calculate the full cost recovery charge to be invoiced to industry for carrying out official controls in meat hygiene.	Internal peer review of model and results.	•	•		•	•				•	
FSA	Risk Assessment models for marine biotoxins in Scottish classified shellfish harvesting areas. [Science-Based]	Assesses the frequency with which classified bivalve shellfish harvesting areas should be sampled (at different times of year) in order to protect public health.	Impacts on sampling budgets and has some potential to impact on public health -although commercial end-product testing provides ultimate safety net.	External specialists developed, validated, and applied the models used. User notes and documentation. Version control. Internally reviewed.	•	•	•	•	•		•		•	•
FSA	Exposure assessment model (Intake2) [Science-Based]	The model is used to estimate the distribution of consumption and exposure to food chemicals for the UK population.	The results are used to inform the needs of policy as they arise. This include regulatory action, providing advice to consumers, identifying issues of concern for future research, etc. Exposure assessment is a key aspect of the risk assessment process. Intake 2 is an appropriate software tool for allowing an assessment of exposure for food chemicals. It allows the assessment of food consumption for routine business and during incidents (including microbiological incidents).	Developer testing, Internal peer review, Use of version control, Transparency, Assessment of fitness for purpose over model lifetime.	•	•		•		•		•	•	•
FSA	PRISM - Probabilistic Improved SPADE (soil-plant-animal dynamic evaluation) Model. [Science-Based]	Food chain modelling for the terrestrial environment used for both routine assessments and for emergency response purposes. Calculates how much radioactive material, that has been deposited on the ground, will transfer into foods.	Used to assess dose (and thus risk) from radioactive waste discharges to help develop our response to applications/permit requests to the environment agencies.	Developer testing and internal peer review. Model checked by scientific experiments for validation and user acceptance testing by the Agency over many years (as previous model, SPADE, and current one PRISM).	•	•	•	•		•		•	•	•
FSA	PRAME - Probabilistic aquatic food chain model. [Science-Based]	Food chain modelling for the aquatic environment used for both routine assessments and for emergency response purposes. Calculates how much radioactive material, that has been released into a water course, will transfer into seafoods.	Used to assess dose (and thus risk) from radioactive waste discharges to help develop our response to applications/permit requests to the environment agencies.	Developer testing and internal peer review. Model checked by scientific experiments for validation and user acceptance testing by the Agency over many years (as previous model, WAT/ADO, and current one PRAME).	•	•	•	•		•		•	•	•
FSA	SPADE (soil-plant-animal dynamic evaluation) Model. [Science-Based]	Food chain modelling for the terrestrial environment used for both routine assessments and for emergency response purposes. Calculates how much radioactive material, that has been deposited on the ground, will transfer into foods.	Used to assess dose (and thus risk) from radioactive waste discharges to help develop our response to applications/permit requests to the environment agencies.	Developer testing and internal peer review. Model checked by scientific experiments for validation and user acceptance testing by the Agency over many years.	•	•	•	•		•		•	•	•
FSA	WAT/ADO aquatic dispersion food chain model. [Science-Based]	Food chain modelling for the aquatic environment used for both routine assessments and for emergency response purposes. Calculates how much radioactive material, that has been released into a water course, will transfer into seafoods.	Used to assess dose (and thus risk) from radioactive waste discharges to help develop our response to applications/permit requests to the environment agencies.	Developer testing and internal peer review. Model checked by scientific experiments for validation and user acceptance testing by the Agency over many years.	•	•	•	•		•		•	•	•
FSA	Dose calculation model. [Science-Based]	Dose estimate model. Uses outputs from food chain modelling to calculate radiological dose exposures.	Used to assess dose (and thus risk) from radioactive waste discharges to help develop our response to applications/permit requests to the environment agencies.	Internal peer review. Validated by Exposure Estimate Team.	•	•	•	•		•		•	•	•
GAD	SuperVal. [Financial Evaluation]	SuperVal is an externally supplied, pension cashflow and valuation model. The model is mainly used to calculate pension costs in respect of past service and future accrual of benefits, and is very regularly used by several teams across the department for a large variety of work leading to client advice.	GAD requires the system to enable it to provide its core function of providing advice to clients. In many cases SuperVal outputs underpin the GAD advice upon which clients make decisions - for example about future pension scheme design. The model influences decisions on most public service pension schemes which, on some measures, are a very large amount of money.	Rigorous user acceptance testing carried out to determine whether bespoke software modifications were correctly implemented, including parallel calculations and documentation of findings. Testing results were peer reviewed internally by qualified actuaries. External review provided by the developers' own QA standards and by a number of other firms across the actuarial profession using the software's core functionality. Strict version control operated to manage the change control process, with reconciliation between versions to confirm changes made. Internal audit review of testing and implementation processes identified lessons which have been applied to ongoing monitoring of functionality and IT capabilities. An identified project team provided governance, particularly during implementation, with challenge to QA processes from Management Board. Any outputs produced from SuperVal which underpin, or are presented in, GAD advice are subject to GAD's internal quality assurance guidelines for documentation, version control, checking and peer review. Spreadsheet construction, use and checking is also subject to GAD's internal standards. Some SuperVal outputs will be published whilst others may be independently verified or reproduced.	•	•	•	•	•	•		•	•	•
GAD	Pension factor calculation models. [Financial Evaluation]	These are a range of individually tailored in-house Excel-based spreadsheets used to calculate actuarial numbers for inclusion in advice to GAD's clients (mainly within Government). Examples include determining the terms of, or the cost of, certain member options in public service pension schemes or calculations concerning the pensions terms for staff transferring from the public sector under the "Fair Deal" policy. Such spreadsheets are used very regularly, although any particular model might not be used more than once.	Figures may be subject to legal challenge if pension scheme members are perceived to have lost out either in terms of benefits or cash. This could be high profile, leading to reputational damage. The amount each model influences varies according to type of advice given - from under £1m up to £bns. Most potential uses are likely to be towards the lower end of this range, but in aggregate we expect the models to influence £billions of payments annually.	Detailed developer testing is undertaken including checks on formulae, reasonableness checks of the results and provision of a documented audit trail. Other QA processes used are: internal peer review of advice by another qualified actuary; rigorous use of version control embedded with the spreadsheets and file naming conventions; governance arrangements including separation of roles and senior staff sign-off; transparency of results which are often published in the public domain; and review of a model's fitness for purpose whenever it is reused. Any outputs produced from these spreadsheets which underpin, or are presented in, GAD advice are subject to GAD's internal quality assurance guidelines for documentation, version control, checking and peer review. Spreadsheet construction, use and checking is also subject to GAD's internal standards.	•	•		•		•		•	•	•

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GAD	Mineworkers' Pension Scheme (MPS) and British Coal Staff Superannuation Scheme (BCSSS) cashflow and valuation models. [Financial Evaluation]	These models project the benefit and expense cashflows of the schemes are used to calculate the schemes' liabilities every three years for the formal actuarial valuations. The models are also used on an ad-hoc basis as needed to provide funding updates and cashflow information for use by the schemes.	The models drive the Government Actuary's decisions which could affect: (a) monies which are paid from/to the scheme to/from the Government as the scheme's guarantor, and (b) the benefits awarded to scheme members which are ultimately guaranteed by the Government.	Detailed developer testing undertaken on the models including checks on formulae, particularly around model amendments. Reasonableness checks of the results are undertaken, with independent parallel calculations checked for sample members and documentation of the models and all changes to the models. Thorough checking and peer review is undertaken of results and model updates, including reasonableness checks. Reconciliations against past results and/or past model versions (with version control recorded within the workbooks). External peer review is provided by scrutiny of preliminary results by scheme secretariats. Governance arrangements including separation of roles and sign-off of final valuation results by the Government Actuary. Results are often published in the public domain and the full valuation reports are available to members on request. The models are reviewed every three years as part of the valuation processes. Any outputs produced from these models which underpin, or are presented in, GAD advice are subject to GAD's internal quality assurance guidelines for documentation, version control, checking and peer review. Spreadsheet construction, use and checking is also subject to GAD's internal standards.	●	●	●	●		●		●	●	●
GAD	Suite of National Insurance models. [Forecasting]	A suite of models used in modelling various aspects of the National Insurance system. The in-house National Insurance contributions model, which is shared with HMRC, is used to estimate and project all classes of National Insurance Contributions (NICs); both those allocated directly to the National Insurance Fund and those allocated to the National Health Service (NHS). The model also projects Statutory Payments (payments on maternity, paternity, adoption and sickness) as well being used when estimating accrual of Additional State Pension benefits. Further models, some of which are shared with DWP or based on DWP models, estimate and project expenditure on Basic State Pension (UK and overseas payments), Additional State Pension and working-age benefits. An Apportionment spreadsheet calculates the amount of total NICs to be allocated to the NHS.	Total annual NICs are in the region of £100 billion, with the NHS allocation in the region of £20 billion. Total annual expenditure on Basic State Pensions (including overseas), Additional State Pension expenditure and Working-age benefit is currently in the region of £83 billion.	Developer testing includes reviews of proposed changes to the model and the implementation of those changes, internal reconciliation of the results, and model documentation. Both proposed updates and final results are internally peer reviewed. External peer review comes from sharing proposed updates with relevant government departments and sharing models with HMRC or DWP. Model output may be compared with corresponding DWP output and historic estimates compared against recent data. NAO audit the National Insurance Fund accounts and some of the models have also been provided and discussed with NAO at their request. Version control is embedded in the models and file naming conventions, and reconciliation between versions is undertaken to confirm changes. Governance arrangements include separation and clear allocation of roles. The three main statutory reports produced are all in the public domain and each of the models are updated whenever they are reused, with periodic reviews going into more detail. Any outputs produced from these models which underpin, or are presented in, GAD advice are subject to GAD's internal quality assurance guidelines for documentation, version control, checking and peer review. Spreadsheet construction, use and checking is also subject to GAD's internal standards.	●	●	●	●		●	●	●	●	●
GAD	Public service pension cashflow model [Forecasting]	This in-house model, used broadly annually or as requested, projects long-term cashflows from unfunded public service pension schemes.	The output from the model has informed, and may inform in the future, overall government decisions about affordability and hence policy on design of public service pension schemes. Projections of total annual expenditure on public service pensions vary depending on the specification of the projection, but expenditure is broadly expected around the range of 1% to 2% of GDP.	Any outputs produced from this model which underpin, or are presented in, GAD advice are subject to GAD's internal quality assurance guidelines for documentation, version control, checking and peer review. Spreadsheet construction, use and checking is also subject to GAD's internal standards. Developer testing and use of version control are undertaken as required by the internal standards set out above. Results are subject to internal peer review by another actuary. The model was subject to external audit by NAO in 2010 with the report in the public domain. Following on from advice from GAD, results based on the model's outputs have been published in HMT and OBR publications providing transparency of results. The model is considered before each future use to ensure it remains fit for purpose.	●	●		●		●	●	●	●	●
GAD	National Insurance Rebate Rate model. [Financial Evaluation]	This in-house model is used for the five-yearly statutory reviews of the rates of National Insurance contribution reductions (rebates) for employees who are contracted-out of the State Second Pension. The model is also used for other advice to DWP, for example on the valuation of state pension rights on divorce.	The Government Actuary relies on the results of this model to advise on the level of contracting-out rebates. The level affects the amount of National Insurance contributions paid in respect of employed workers. National Insurance Contribution reductions for employees who are contracted-out of the State Second Pension are estimated to be in the region of £6bn in 2012/13 (GB only).	This model has been developed over three statutory review periods, and is reviewed at each substantive use. Governance and rigorous checking is provided by separation of doer, checker and reviewer roles and the overall results are checked for reasonableness by a senior actuary. The final report to Parliament is signed by the Government Actuary who seeks confirmation of compliance with checking and reviewing procedures before sign-off. The report includes a peer reviewed, reconciliation of the model results against the previous rates. External review and challenge is provided through a consultation process on the assumptions and the provisional rebate rates. The final report includes the overall rebate rate recommended, providing transparency of results. Any outputs produced from this model which underpin, or are presented in, GAD advice are subject to GAD's internal quality assurance guidelines for documentation, version control, checking and peer review. Spreadsheet construction, use and checking is also subject to GAD's internal standards.	●	●	●	●		●		●	●	●
GAD	NHS data manipulation models. [Financial Evaluation]	These in-house models are used each year to analyse and adjust the membership data received for the NHS pension schemes. Within the data there is clearly erroneous information that needs to be filtered out before liability calculations are undertaken. Liabilities are then adjusted to approximately allow for excluded members for whom appropriate data was unavailable.	The outcome from these models influences liability calculations for the NHS pension schemes and hence future scheme funding requirements. The model affects annual contribution rates to the NHS pension schemes.	Detailed developer testing undertaken including checks and documentation of both formulae and individual modelling stages. Output is tested for consistency with historic information and differences in the resulting liability calculations are explained. Methodology points are peer reviewed internally and alternative approaches considered. Version control is embedded within the file naming convention and in the model, and reconciliations undertaken between versions to confirm changes. Governance arrangements include separation of roles for model development and review, with accompanying documentation. The models are reviewed and amended as needed each time they are used. Whilst the resulting calculations which these models feed into are published, the direct output from these models is not published. Any outputs produced from these models which underpin, or are presented in, GAD advice are subject to GAD's internal quality assurance guidelines for documentation, version control, checking and peer review. Spreadsheet construction, use and checking is also subject to GAD's internal standards.	●	●		●		●		●		●
HMRC	VAT Own Resources. Policy model. (In house.) [Policy Simulation]	The model is used to estimate the weighted average rate of VAT used to calculate the intermediate VAT base, and also the UK specific derogations used to calculate the final VAT base. This provides the basis for the amount of money the UK needs to contribute to fund the EU.	Determines the amount of money the UK needs to contribute to the budget of the European Union. Any errors in the model could engender serious financial, legal, reputational damages, penalties or accrue interest. This is a legal requirement, and the return must be delivered within a set time frame.	The model is extensively quality assured, including external auditing of the model, given the work is a legal requirement with serious financial consequences for the UK.	●	●	●	●	●	●	●	●	●	●

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HMRC	Indirect tax forecasting. Forecasting model. (In house.) [Forecasting]	Used to produce forecasts of all indirect tax receipts, such as VAT, road fuels and alcohols. This covers around 30% of tax receipts for the next 5 years and is a key part of the public finance forecasts.	Provides key part of the receipts side of the public finance projections. Errors in the forecast would lead to poor decisions about how much spending needs to change to meet fiscal targets. Errors on monthly basis mean debt management office may not make best use of market transactions around borrowing.	The model is quality assured by internal peers and the outputs are assured by those at the OBR and IFS, as the published forecasts are put into the public domain as part of the OBR's regular Economic and Fiscal Outlook report.	●	●	●	●		●		●	●	●
HMRC	VAT Theoretical Tax Liability calculations. Policy model. (In house.) [Policy Simulation]	The model is used to calculate the theoretical VAT liability, and - by comparing the theoretical liability to actual receipts - to produce an estimate of the VAT gap.	Used as a basis for policy costings and for the VAT revenue forecast. Also the VAT gap estimates feed into the total tax gap analysis and is therefore a very useful tool, alongside others, that helps the department with strategic thinking and business planning in a number of ways. In particular, by giving an assessment of long term trends and by quantifying types and causes of non-compliance by tax regime and customer group. It isn't used as a performance target, but does support business planning and provides a long term health check to validate the strategic decisions taken by the department and our effectiveness in tackling major risks.	The model is quality assured by those with the necessary level of expertise, which includes those individuals within the immediate team, as well as internal stakeholders such as the VAT Gap Governance Group and those with operational expertise.	●	●	●			●		●	●	●
HMRC	Excise, Customs, Stamps & Money Policy costings models. [Policy Simulation]	A suite of spreadsheet models to estimate tax policy changes for the following taxes: Excise duties (alcohol, tobacco and gambling), environmental taxes (climate change levy, EU emissions trading scheme, Carbon price floor, aggregates levy, landfill tax), Air Passenger Duty, Vehicle Excise Duty, Stamp Duty on Shares. Each calculates the likely change in yield from making a policy adjustment to a particular tax. Includes estimates of behavioural change.	Each model is not business critical individually, but as a package these taxes are significant and so the suite of models is critical overall. The models are used for costing changes in tax policy announced by the Chancellor of the Exchequer at the Budget and Autumn Statements. Errors in these costings would effect the Chancellor's decision-making and Public finance outcomes.	The models are reviewed on an ongoing basis given the nature of the work. Given the outputs are published by OBR as part of their Economic and Fiscal outlook publications, the OBR quality assures all new models and model outputs.	●	●	●	●		●		●	●	●
HMRC	Stamp Duty Model (SDM): policy simulation and forecasting model (In house.) [Policy Simulation]	The SDM is a SAS-based micro simulation model that samples historic Stamp Duty Land Tax (SDLT) administrative data and projects it forward using housing market determinants. The model includes functionality to change the SDLT rates and thresholds to allow estimation of the impact of policy changes. It is also used to forecast SDLT receipts.	The SDM is used to forecast expected SDLT receipts and cost SDLT policy changes announced by the Chancellor at the Budget and Autumn Statement. Errors in either would affect the Chancellor's decision-making and Public finance outcomes.	The models are reviewed on an ongoing basis given the nature of the work. Given the outputs are published by OBR as part of their Economic and Fiscal outlook publications it quality assures all new models and model outputs.	●	●	●			●		●	●	●
HMRC	Fuel Duty Costing Model Policy costing model (In-house) [Policy Simulation]	The model is an Excel-based model, which feeds in inputs from several different sources, which is used to calculate the post-behaviour exchequer impact of changes to the fuel duty rate for fuels covered by the Hydrocarbon Oils Duty Act.	Calculates the post-behavioural exchequer impact of changes to the Fuel duty rate for petrol, diesel and other fuel types covered by the Hydrocarbon Oils Duty Act. Produces ministerial briefing numbers on the impact of this change upon prices of fuel at the pump, the cost of motoring for popular cars the cost of motoring for hauliers.	The models are reviewed on an ongoing basis given the nature of the work. Given the outputs are published by OBR as part of their Economic and Fiscal outlook publications it quality assures all new models and model outputs.	●	●	●	●		●		●	●	●
HMRC	Oil & Gas Tax Revenues Forecasting Model, Capital Allowances Forecasting Model, Corporation Tax (CT) Forecasting Model, Bank Levy Forecasting Model (in house) [Forecasting]	The oil & gas tax revenues forecasting model is a SAS based model that forecasts future tax revenues from oil & gas sector companies based on assumptions about future levels of oil and gas production, expenditure and prices for individual fields and companies. The capital allowances forecasting models are Excel models based on data from tax returns for past capital allowances claims and taking into account the OBR's forecasts for future levels of businesses' investment expenditure. The CT forecast is an Excel based model that forecasts future tax revenues on a sectoral basis. Inputs are CT receipts, information from CT returns and economic determinants provided by the OBR. The Bank Levy using current receipts data to forecast future Bank Levy receipts.	Not necessarily business critical individually, but significant as a package. If the models were not available or not working correctly it would reduce our ability to produce accurate forecasts of future tax receipts for the Budget and Autumn Statement.	The models are regularly reviewed and the results from them are regularly assessed and tested to help us to ensure that they are accurate.	●	●	●	●		●		●	●	●
HMRC	Corporation Tax (CT) and Bank Levy monitoring. (In house.) [Forecasting]	Daily tax receipt data is extracted from HMRC administrative systems using SAS and then recorded in Excel. Comparisons are made with the latest corporation tax forecast on a daily basis and cumulatively over each month.	Output is used to compare to the amounts forecast at the last fiscal event. Analysis is provided to HMT and HMRC customers on a monthly basis and informs policy and resource decisions.	The outputs are reconciled on a monthly basis with cashflow information from Finance, providing a check that the reporting is consistent with a separate information source.	●	●	●			●		●	●	●
HMRC	Small Profits Rate of Corporation Tax, Main Rate of Corporation Tax costing models. (In house.) [Policy Simulation]	The models are Excel based, they estimate the difference in Corporation Tax (CT) would expect to accrue when current and proposed rates apply or when thresholds for the different rates of CT are changed.	Informs decisions on whether to change Corporation Tax rates or thresholds.	The models are regularly reviewed and updated. They are quality assured internally and outputs are reviewed by the OBR.	●	●	●	●		●		●	●	●
HMRC	Compliance Resource Allocation Model (CRAM). (In house.) [Allocation]	The model is Excel based with inputs from HMRC's performance statistics, and staff deployment.	Provides outputs that feed Enforcement and Compliance business planning and inputs into business cases for new initiatives for investment committee to make spending decisions.	The model is extensively quality assured given the work directly influences HMRC's business planning and deployment of staff.	●	●	●	●		●		●		●
HMRC	VAT predictive model (In house analysis, although owned by another part of HMRC). [Planning]	Produces an expected yield amount which risk ranks all VAT businesses.	Aids decisions on which VAT businesses to visit within the SME population.	The models are cross-validated by multiple analysts during development, and the framework is validated by tax experts. The methodology is peer-reviewed by externally recruited predictive analytics specialists, and an in-house Predictive Analytics handbook describing industry-standard credit scoring techniques is used. Model accuracy is reviewed periodically to ensure robustness.	●	●		●		●	●	●		●
HMRC	Costing model for the UK-Swiss Tax Agreement. (In house.) [Policy Simulation]	Excel based model used for estimating the amount of yield expected from the UK-Swiss Tax Agreement.	High level of yield calculated for budgetary calculations.	The model was discussed regularly with internal stakeholders to ensure it was correctly representing the negotiated agreement. Additional to this, the key assumptions were tested with external stakeholders as well. The model was also discussed on a number of occasions with the OBR who provided a critical appraisal and challenge to the approach taken and assumptions used.	●	●	●	●		●		●	●	●
HMRC	Debt Management & Banking Spending Review 2010 staffing model. (In house.) [Planning]	The model is an Excel-based model, which uses Debt Management information and business assumptions from operational experience.	Drives key funding decisions essential to the achievement of business plan priorities. Calculated high level of yield for re-investment.	The model was reviewed by the analytical team and subject experts elsewhere in HMRC during its development, and is subject to a rolling programme of continuous improvements. It has also been subject to review by HMT. Changes in the model's assumptions are sensitivity-tested using Monte Carlo simulations.	●	●	●	●		●		●		●

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HMRC	Personal Tax Model (PTM) (Model development and maintenance - in house. Major changes are delivered by HMRC's IT contractor in line with change requests specified by HMRC model users.) [Policy Simulation]	PTM is a SAS based micro simulation model of the UK income tax system, computing income tax liabilities for a large and representative sample of potential income taxpayers provided by HMRC's annual Survey of Personal Incomes (SPI) dataset, conditional on the rules of the tax system defined by the base and tax system parameters specified by the model user. The model provides distributional analysis of the income tax base as well as estimated costs and impacts on individuals of income tax policy changes.	PTM analyses and outputs inform decisions on income tax policy, with risks that that policy choices are misinformed or costs understated.	The model is internally reviewed on a continuous basis through validation of model outputs against other income tax calculators, previous work, and external analyses or results from comparable models where available, and using quality assurance guidelines. The PTM model and policy costings are subject to external review by the OBR and a range of model outputs are published as National Statistics with supporting documentation. An external developer implements major changes to the model code.	•	•	•	•		•		•	•	•
HMRC	Income Tax forecasting models (in-house) - Pay As You Earn (PAYE), Self Assessment (SA), Income Tax repayments and Other Income Tax. [Forecasting]	The models are Excel based with various inputs such as key economic determinants and historic receipts data. It forecasts Income Tax receipts by projecting the latest full year of receipts data using key economic drivers and policy measures.	Forms part of the forecast of total exchequer tax revenues. Drives key spending decisions for government.	The models are reviewed and tested on an ongoing basis and extensively quality assured by internal peers. The outputs are assured by those at the OBR, as the published forecasts are put into the public domain as part of the OBR's regular Economic and Fiscal Outlook report.	•	•	•	•		•		•	•	•
HMRC	National Insurance Contributions - forecasting model (currently based on a model developed by Government Actuary Department). [Forecasting]	The model is an Excel based model with various inputs such as key economic determinants and historic receipts data. It forecasts class 1 NICs based on data from the Annual Survey of Hours and Earnings (ASHE), giving numbers of employees grouped by weekly earnings band, their gender and age. NICs rates and thresholds are applied to calculate NICs liabilities for each band. Indexation, policy measures and announced changes to rates and thresholds are included.	Forms part of the forecast of total exchequer tax revenues. Drives key spending decisions for government.	The model is reviewed and tested on an ongoing basis. The model is extensively quality assured by internal peers and Government Actuary Department (GAD) who also use the outputs from the model. The outputs are also assured by those at the OBR, as the published forecasts are put into the public domain as part of the OBR's regular Economic and Fiscal Outlook report.	•	•	•	•		•	•	•	•	•
HMRC	Capital Gains Tax (CGT) forecasting model and Inheritance Tax (IHT) forecasting model. (In house.) [Forecasting]	Capital Gains Tax (CGT) model forecasts CGT accruals and receipts depending on the estimated level of accruals in a base year and assumptions made for growth in key economic determinants in each forecast year since the base year, and includes forecasts of yield/cost of policy measures which were not implemented in the base year. The IHT forecasting model is a SAS and Excel based micro-simulation model which projects IHT data on estates left on death forward using determinants provided by the OBR. It is used to forecast IHT receipts and to model policy changes.	Contributes to forecast of total exchequer tax revenues and policy costings.	QA consists of internal consistency checks between outputs, sense checks that determinant changes have the expected effects and line manager reviews of the model and its outputs, together with the possibility of QA checklist review. Forecasts are also subject to QA sense checks by OBR.	•	•	•	•		•		•		•
HMRC	HMRC's Computable General Equilibrium model (CGE). (The development of this economic model is mostly outsourced and partly developed in-house. Simulations of policy options are run in-house.) [Policy Simulation]	HMRC's Computable General Equilibrium (CGE) model is a complex model of the UK economy, which is used for policy development, in particular at looking at the impact of large changes to tax policy on GDP and its components.	The outputs of the model inform HM Treasury of the expected economic impact of intended tax changes and therefore influences the package of tax changes that are ultimately chosen. It also informs the assessment of the package of environmental policies that are chosen by the Government to meet the UK's Carbon reduction targets.	Quality assurance includes: internal peer review of the outputs and model developments; triangulation of the outputs from the model with academic theoretical and empirical findings; the use of sensitivity analysis of the impact of changing some of the key model assumptions; discussions of the draft results with HM Treasury customers; using external academics to review model developments; internal audits of the quality assurance processes undertaken.	•	•	•	•		•				•
HMRC	Error and Fraud Analytical Programme (In house.) [Planning]	The Error and Fraud Analytical Programme estimates of the level of error and fraud in the tax credits system based on a statistically robust sample of cases with data extracted post-finalisation each year.	Key data for measuring performance against the tax credits error and fraud target and influencing operational activity to meet it.	Quality assurance includes internal peer review of outputs and sense checking using previous years results in conjunction with known policy/operational changes that may impact the model; external peer review is carried out by NAO who audit the model each year. Any changes to the model are reviewed within the analytical team, and if significant with NAO, before being actioned. Updated documentation is produced each year.	•	•	•			•		•	•	•
HMRC	Real Time Information (RTI) in Tax Credits. (In house.) [Planning]	The model uses tax credits data to estimate and forecast expenditure savings from net reductions in error, fraud and overpayments achieved by using RTI in tax credit operational processes.	Underpins a key programme business case. Also underpins DWP's Universal Credit business case.	The model is validated by the developer team, cross-checked by peers within HMRC, and outputs have been shared with DWP analysts. New versions are produced for audit trail purposes when data and assumptions are updated. The model is modified and enhanced over time in line with the wider RTI programme's development.	•	•	•	•		•				•
HMRC	Tax Credits Forecast Model (In-house). [Forecasting]	The Tax Credits Forecast model is primarily used to forecast total Personal Tax Credit expenditure (both Annually Managed Expenditure & negative tax components), estimates the impact of Tax Credit policy measures and forecast the Tax Credit claimant caseload. Its base is a SAS micro-simulation which is used as an input to an Excel model, where other adjustments are made.	Total expenditure feeds into the OBR's integrated public finance forecasts. The model also informs decision making on high profile Tax Credit policies and, to a lesser extent, operational delivery and resource allocation within HMRC.	Model is continuously quality assured due to its frequent use and is validated against outturns. Responsibility for modelling changes is shared amongst several analysts and so internal review takes place before changes are made. Sign-off responsibility & governance is by the OBR, who also agree any major modelling changes. Detailed documentation is in place and each change is saved as a different version for audit trail purposes. Publication of forecasts and policy decisions provides transparency, and the OBR's Forecast Evaluation Report helps to ensure the model is kept fit for purpose.	•	•	•	•		•		•	•	•
HMRC	Child Benefit Forecast Model (In-house). [Forecasting]	Excel-based model used to forecasts total Child Benefit expenditure and estimate the impact of Child Benefit policy measures.	Total expenditure feeds into the OBR's integrated public finance forecasts. The model also informs decision making on high profile Child Benefit policies and, to a lesser extent, operational delivery and resource allocation within HMRC.	The model was reviewed and signed off by OBR at development stage and any modelling changes or policy costings will follow the same governance structure. Internal review is provided by analysts on the team. Model is well documented and version control is employed to create an audit trail at each fiscal event. Expenditure forecasts and policy costings are published to provide transparency of outputs.	•	•	•	•		•		•	•	•
HMT	Scorecard Planning model - Simple calculator to work out the total impact of policy decisions on Public Sector Net Borrowing. Model is in house. [Planning]	Calculates the impact of policy options on Public Sector Net Borrowing over the forecast horizon.	Critical to Autumn Statement and Budget policy decision making.	Simple calculator with inputs from HMRC, other departments, and OBR. Published in the Budget/Autumn Statement documents and the OBR's Economic and Fiscal Outlook. Governance structure through HMT and OBR.		•	•	•				•	•	•
HMT	Barnett formula: Funding allocation model. [Allocation]	Model determines changes to spending allocations for the devolved administrations. It applies a population-based formula to changes in planned spending on comparable services in UK Government departments. This ensures the Scottish and Welsh Governments and Northern Ireland Executive receive a population based proportion of changes in planned spending on comparable service in England, England and Wales, or Great Britain as appropriate.	Drives key funding decisions.	Model is set by Statement of Funding Policy, published and reviewed at regular intervals (periodic review) with approval of Ministers (governance). Inputs and outputs subject to developer testing, internal and external peer review (particularly by the devolved administrations as the recipient of allocated funding), use of QA guidelines. Allocations published at Spending Reviews (transparency).	•	•	•			•		•	•	•
HMT	IGOTM (Intra-Governmental Tax and Benefit model) - analysis of AME spending. [Policy Simulation]	Microsimulation model calculating tax paid, and tax credit and benefit receipt by households in a baseline (counterfactual) world and a new policy world across the income and expenditure distributions. Output is an analysis of the impact of changes in Government policy on households in each income or expenditure decile.	Used for ministerial advice both on an ongoing basis and in the development of the scorecard at fiscal events. Produces the figures used to create the published distributional impact charts at fiscal events. Valued by Ministers and SpAds in decision making and the production of analysis and assessment of the fairness agenda at fiscal events. Essential to achievement of business plan priorities and maintaining HM Treasury's analytical reputation.	Developer testing, internal peer review, external peer review, use of version control, QA guidelines and checklists, governance, transparency, assessment of fitness for purpose.	•	•	•	•		•		•	•	•

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HMT	IGOTM (Intra-Governmental Tax and Benefit model) - analysis of RDEL spending. [Policy Simulation]	Currently a spreadsheet model, used to aggregate spending departments' estimates of the impact of their RDEL spending across the income distribution. Development of a microsimulation model, which will run through the main IGOTM model (above), is in progress and due to be completed late next year. This will use regression modelling to estimate usage of public services, rather than relying on top-down estimates.	Used for ministerial advice both on an ongoing basis and in the development of the scorecard at fiscal events. Produces the figures used to create the published distributional impact charts at fiscal events. Valued by Ministers and SpAds in decision making and the production of analysis and assessment of the fairness agenda at fiscal events. Essential to achievement of business plan priorities and maintaining HM Treasury's analytical reputation.	Developer testing, internal and external peer review, external peer review, use of version control, QA guidelines and checklists, governance, transparency, assessment of fitness for purpose, validation against external data.	●	●	●	●		●		●	●	●
HMT	Forecasting Net Exchequer Cash Position model. [Forecasting]	Forecasts net Exchequer transactions and net cash position on a daily basis for a period of up to 19 weeks. Incorporates data from HMRC on tax receipts and from departments on their net spending. Provides a system for making intra day revisions to the Net Exchequer Position and reports for the DMO.	DMO's function is to raise the necessary cash to fund Government expenditure not met by tax receipts through a mixture of debt and cash management. Their objective is to balance the Government's cashflows each day and the forecasts provided by the model inform this process. Inaccurate forecasts can increase costs to the Exchequer and have reputational damage.	Developer testing, internal peer review, use of version control, internal audit, governance, model development.	●	●		●	●			●		●
HMT	Costings model for the resource budget savings in 2013-14 and 2014-15 announced at Autumn Statement 2012. [Policy Simulation]	Simple Internal calculation model used to provide advice on policy measure at Autumn Statement. Generated costings figures for the Autumn Statement scorecard.	Influenced decisions about the level of reallocation between resource and capital budgets made in the run up to Autumn Statement.	The QA processes applied were proportionate to the complexity of the model, with the main focus on rigorous internal checking of the underlying data and cross-referencing with published sources.	●	●		●		●		●	●	●
HMT	Resource budget policy simulation model for next Spending Review. [Policy Simulation]	Internal allocation model used to provide advice on different scenarios for setting departments' budgets in 2015-16.	Feeds into policy analysis around allocating departments' budget settlements in 2015-16.	Proportionate to complexity. Outputs/calculations frequently internally challenged/cross-checked against other sources.	●	●		●		●		●		●
HMT	Central spending model. [Policy Simulation]	Internal model used to inform advice on top-down spending impact of different fiscal scenarios; and to advise on spending envelopes over the Government's 5 year forecast period.	Informs the planning of government spending.	Thorough internal checks built into model and outputs are checked and cross-referenced with external material and independent calculations as far as possible.	●	●		●		●		●	●	●
HMT	Yield Curve Tool (YCT). [Financial evaluation]	This model is used to produce a gilt yield curve, which is essentially a smooth, continuous, set of yields for the full maturity spectrum over which gilts are issued. Data from the model are used to calculate lending rates to local authorities and are used in much of the gilt market analysis and modelling work undertaken by the DMO, both during the year and as part of the annual debt management remit advice for HMT.	The most business critical use of the model is to calculate lending rates on fixed rate loans made by Central Government to local authorities through the Public Works Loan Board (PWLB). The DMO runs the model twice a day to reset several hundred interest rates. In the event that the rates calculated by the model were incorrect then this could potentially expose the Government to reputational and financial risk.	The specification of the yield curve model used by the DMO was originally produced by the Bank of England as a result of several years of research into the optimal yield curve model. This research was published in the form of a 2001 Bank of England Working Paper. The Bank of England coded the model and has been using it (including publishing results on a daily basis) since 1999. The Bank provided the DMO with a copy of the model code and this was then adapted to work with the DMO's IT systems. As part of the implementation the DMO worked with external consultants to review the Bank code in order to ensure that the model calculations were correctly coded. Some calculations were added to the program and primarily relate to the calculation of PWLB interest rates - the DMO provided the specifications for these changes. The DMO's implementation of the model was managed through a formal project management framework and included tests which validated the results from the model. The consultants operated a QA system based on ISO 9001:2000 and TickIT. Since the DMO began using the model in June 2007 it has employed consultants to make changes to the program on several occasions but these have not related to the core model, they have related either to the additional calculations that the DMO has added to the code or to 'technology' changes necessary to ensure the program can continue to interact with other DMO IT systems. Work is undertaken in accordance with ISO 9001:2008 and TickIT accredited Quality Management System and ITIL principles. The DMO uses version numbering and source control in its management of the yield curve code. Various aspects of the DMO's use of the model have been audited within the DMO. The Bank of England periodically changes its yield curve model and so if it were to move to a new model in the future the DMO would consider whether or not to follow suit.	●	●	●	●		●		●	●	●
HMT	Portfolio Simulation Tool (PST). [Forecasting]	The PST models the impact that different gilt and Treasury bill issuance strategies would have on the characteristics of the Government's debt portfolio in the future. It is also used to help assess the relative cost-effectiveness and riskiness of issuing different types and maturities of gilts.	The DMO provides data from the PST to HMT/OBR for use in their forecast of PSND (Public Sector Net Debt) as part of the Budget forecasts. The PST is also used by the DMO in analysis that forms part of the annual debt management remit advice for HMT.	The specification for the PST was produced by the DMO. An article describing the model was published by the DMO in 2009 and the model has been presented at international debt management conferences. Results from the model are published annually in HMT's Debt & Reserves Management Report. The model code was written by consultants and was extensively tested by the DMO in order to ensure the accuracy of the calculations. The DMO also reviewed parts of the code. The DMO's implementation of the model was managed through a project management framework and the consultants operated a QA system based on ISO 9001:2000 and TickIT. The DMO uses source control in its management of the PST code. Periodically the DMO has employed consultants to make changes to the model either to extend its functionality or to ensure that it remains representative of the issuance practices that the DMO follows in its actual gilt market operations. Work is undertaken in accordance with ISO 9001:2008 and TickIT accredited Quality Management System and ITIL principles.	●		●	●		●		●	●	●
HMT	Cognos Enterprise Planning - Value Indicator calculation. [Financial Evaluation]	A calculation from NS&I's Cognos Enterprise Planning model that generates actual and forecast values for NS&I's Value Indicator (VI) measure.	Directly related to our VI SDM (service delivery measure) and used for pricing decisions.	Monthly (sometimes bi-monthly) Governance through Pricing Committee and an annual review by KPMG of this SDM.	●	●	●	●	●	●	●	●	●	●
HMT	Cognos Enterprise Planning - Net Financing (NF). [Financial Evaluation]	A calculation from NS&I's Cognos Enterprise Planning model generating Net Financing (NF) by product, channel and Calculated Accrued Interest (CAI).	Directly related to our NF SDM (service delivery measure).	Monthly forecasting meeting and monthly Marketing & Sales (MSC) Governance committee with an annual review of this SDM by KPMG.	●	●	●	●	●	●	●	●	●	●
HMT	Retender (Project YODA) Pricing Model. [Procurement & Commercial]	An Excel based model designed to ensure NS&I can evaluate the bidder's costs in a directly comparable manner.	Impacts who NS&I's outsourced business partner will be.	The model calculation was validated internally and then by PA Consulting. Once populated by the bidders, the models and outputs were validated by an appropriate independent party that they nominated. The NS&I Executive Committee (ExCo) also received formal assurance on the YODA model from an independent external review team at PA consulting.	●	●	●	●		●	●	●	●	
HO	Communications Capabilities Development (CCD) Programme Business Case Benefits and Costs Models. [Financial Evaluation]	Costs Model calculates projected financial and economic costs of CCD Programme. Costs Model is currently being developed to interact with Benefits Model. Benefits Model calculates stakeholder assessment of uplift in capability the CCD Programme will deliver. A relationship is modelled between capability uplift the CCD Programme will deliver and stakeholder performance metrics e.g. lives saved, children safeguarded etc. Where appropriate an economic value is calculated for these performance metrics from which the total economic benefit of the CCD Programme is calculated. Internal department Models for generating OBC values and external to department for HMT OBC approval and MPA quarterly reporting. Costs and Benefits estimates used externally as evidence to the Joint Committee on the Draft Communications Data Bill. Costs and Benefits estimates calculated over 10 year life of Programme.	High profile policy initiative. On main HO risk register and Group Investment Board monitoring systems.	QA for the CCD models was designed to be appropriate to a large and complex model suite which draws largely on classified information, supports a major financial investment over several years, and describes a policy which has not previously been implemented, for which very limited pre-existing data on effects are available. The scale of the model meant that clear documentation and version control processes were important, as were repeated waves of developer testing including detailed calculation checks by internal peers; the novelty of the policy required a rigorous process for testing assumptions with stakeholders and others, and repeated waves of internal peer review. The sensitivity of the material meant that full external peer review and transparent publication were not available in this case, though the model has been opened to challenge within a more limited community and its results have been subjected to end-to-end testing against alternative models.	●	●		●	●	●		●		●

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HO	E-Borders. [Financial Evaluation]	A family of projects aimed at establishing a modernised, intelligence-led Border Control Framework.	High profile policy initiative. On main HO risk register and Group Investment Board monitoring systems.	QA for the E-Borders model was designed to be appropriate to a standard appraisal type model which draws largely on internal and published information, and supports a major financial investment over several years. The use of the model for financial evaluation meant that clear documentation and version control processes were important, as were developer testing including detailed calculation checks by internal peers. The novelty of some aspects of the modelling required a rigorous and iterative process for testing assumptions with stakeholders, and waves of internal peer review. The sensitivity of the material meant that full external peer review and transparent publication were not available in this case, though the model has been opened to challenge within a more limited community and its results subjected to end-to-end testing against the delivery of outcomes.	•	•	•	•		•			•	•
HO	Police Pay and Workforce models. [Policy Simulation]	Models output projected workforce numbers which are then used to calculate costs and savings of changes to the pay and conditions of police officers.\n\nThe independent Winsor modelling fed into the two published reports.\n\nHome Office modelling was used in negotiations with the police over pay and conditions recommended in the Winsor reports.	Home Office modelling informs Home Office's position in negotiations over police pay and conditions.	QA for the PPW models was designed to be appropriate to a large and complex model suite which draws largely on internal management information and some published material, and supports a major financial initiative. The scale of the models meant that clear documentation and version control processes were important, as were repeated waves of developer testing including detailed calculation checks by internal peers. The novelty of the modelling approaches required rigorous processes for testing assumptions with stakeholders and others, and repeated waves of internal peer review. The importance and public nature of the processes supported by the models meant that full external peer review and transparent publication were available although at a less detailed level for some of the technical data. In particular, the models have withstood robust challenge against a number of alternative models.	•	•	•	•	•	•	•	•	•	•
HO	Disclosure and Barring Business Model [Procurement & Commercial]	Describes the forecast volumes, costs and benefits in relation to the Government's plan to modernise the services previously delivered by the Criminal Records Bureau and the Independent Safeguarding Authority - since December 2012 these services are now delivered by the Disclosure and Barring Service. The Model was developed to support the Programme Business Case and includes wholelife costs, volumetrics, sensitivity analysis, cost of supplier bids, and benefits.	High profile policy. Monitored under Group Investment Board process.	QA for the DBS model was for a relatively less complex model which draws largely on internal information, but supports a major financial investment over several years, as well as a policy undergoing significant change. Developer testing including calculation checks by internal and external peers has been carried out. The modelling approach was bespoke to the particular purpose of the model; the approach was discussed and agreed with relevant public sector stakeholders. The model development was further assured through internal and external peer review, and use of model outputs are controlled through programme governance.	•	•	•	•	•	•		•	•	•
HO	Integrated Casework Benefits Framework (UK Border Agency). [Procurement & Commercial]	Describes the anticipated benefits that will be delivered from investment in ICW. It informs the Economic Case of the ICW Programme Business Case.	Describes the benefits of a high profile and major IT programme that underpins the transformation of the Agency over the next three years. Will be critical to the securing of ongoing funding in 2013.	QA for the ICW model was designed to be appropriate to a simple, standard appraisal model which draws largely on internal management information and business expertise, supports a major financial investment over several years, and supports a business change programme whose effects are reasonably well-understood. The scale and importance of the model meant that clear documentation and version control processes were important, as were repeated waves of developer testing including detailed calculation checks by internal peers. The reliance on inputs based on judgements in business areas required a rigorous process for testing assumptions with stakeholders and others, and repeated waves of internal and external peer review. Transparent publication was not available given the sensitivity of the model estimates.	•	•	•	•	•	•	•	•		•
HO	Fee Models 1 - UK Border Agency. [Planning]	Sets fees for all UKBA visa products.	Key income stream vital for delivering main business priorities.	QA for the Fee models was designed to be appropriate to a large and complex model suite which draws largely on internal management information and some published statistics, and supports a major area of business delivery. The scale and volume of models meant that clear documentation and version control processes were important, as were repeated waves of developer testing including detailed calculation checks by internal peers and regular challenge from an experienced user group. The importance of the model suite required a rigorous process for testing assumptions with stakeholders and others, and repeated waves of internal peer review. The model outputs (fee levels for visa products) are published annually.	•	•	•	•	•	•	•	•	•	•
HO	Fee Models 2 - Identity and Passport Service. [Planning]	Setting fees requires the use of a number of models:\na) Domestic Passport Demand Model: This extrapolates actual (historical) trend data from the overall volume of domestic passports and forecasts the volume of applications in the short and medium term. The outputs are used to work out the population over which to spread product specific costs in the ABC model and in driving volume related costs in the 4-Year Forecast model.\n\nb) 4-Year Forecast: This is a basic financial forecast that gives a reasonably scientific estimate of our costs for the spending review period to enable us to a) manage our performance against the forecast and b) work out the total amount that we need to recover through fees to ensure that we can deliver on our commitment to be self funded.\n\nc) Domestic Passport Activity Based Cost (ABC) Model: This model allocates elements of cost by driver to each product and customer/service type.\n\nd) Domestic Fees Model: This model combines the outputs of the Demand Model and 4-Year Forecast to ascertain the average income that IPS will generate at the current average fee and, therefore, the amount of change required in average fee to achieve a post cost-of-capital break-even position for each year in consideration. It then refines this using actual fees by customer and service type, varied up or down as required to test various options.\n\ne) Passport Unit Cost Model: This uses an extract from the ABC model to demonstrate unit cost per customer/service type and is used to validate that the modelled varied fee from the Fees Model is appropriate or needs to be amended, based on HMT guidance requiring break-even per customer/service type.	Key income stream vital to fund domestic passport issuing.\n\nNote: models used currently to set fees for domestically issued passports.\nModels to set overseas fees on full process repatriation (expected April 2014) currently under construction.	QA for the IPS models was designed to be appropriate to a complementary set of models which draws largely on internal management information and some National Statistics, and underpins key resourcing decisions on an annual basis. As the model is used to set user fees model accuracy affects a large number of people and so repeated waves of developer testing have been undertaken, including detailed calculation checks by internal peers; the significance of the main models also required a rigorous process for testing assumptions with stakeholders and others. Unit costs, IPS financial forecasts and fee levels are published.	•	•	•	•	•	•		•		•
HO	Police Allocation Formula. [Allocation]	Key outputs are police force area allocations of Police Main Grant.	These allocations are approved by Parliament in the annual Police Grant Report. If the allocations were found to be incorrect, an amending report would need to be laid in Parliament and voted on, generating serious reputational damage.	QA for the PAF model was designed to be appropriate to a standard model which draws largely on internal management information and some published sources, and supports a major funding allocation process. The scale of the model meant that clear documentation and version control processes were important, as were repeated waves of developer testing including detailed calculation checks by internal peers. The importance of the model required a rigorous process for testing assumptions with stakeholders and others, and repeated waves of internal and external peer review. The very public nature of the model meant that full external peer review and transparent publication were made available, the outputs were opened to rigorous challenge within a wider community, and its results subjected to comprehensive end-to-end testing.	•	•	•	•	•	•	•	•	•	•
MOD	Civilian/military personnel planning models.\n\nModels developed in-house. [Planning]	Models careers, promotions and exits for military and civilian personnel.\n\nIdentify potential shortages/surpluses to help MoD make decisions about recruitment as well as other manning levers.\n\nInforms decisions regarding assessments of sustainability and or affordability of options.\n\nInforms Treasury and Office for Budget Responsibility for pensions forecasts.	MoD need robust modelling to ensure correct level and right mix of personnel to deliver operational capacity and the business plan.	Methods include ensuring models work as designed, comparison to previous versions, robustness/suitability of the models and an assessment of the quality of input information.	•	•	•	•	•	•	•	•	•	•

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MOD	Force Structure Cost Model (FSCM) [Forecasting]	The model estimates the cost of the Defence Programme out to 30 years. Key outputs include: Cost of Force elements (Equivalent Annual Cost, Whole Life Cost, etc) to inform Balance of investment studies Manpower and Equipment, pan defence for each element estimates the cost of the overhead element of defence. The model is not a programming / budgeting tool, but it can be used to provide a quick check of whether a Force Structure is affordable.	Supports high level Force Structure planning including the SDSR Currently the only high level model in defence that takes into account most of the cost base, and allows it to be compared in a fair manner.	Data is updated every year Model code, etc, tested by the developer Review of data mappings by the military / Capability areas Internal consistency checked against previous versions of the model External consistency checked against the defence programme, and other high level models (for force structure level comparison) Full validation / data management guide / Tech doc created annually, or after each code update.	•	•		•	•	•	•	•		•
MOD	Strategic Balance of Investment Linear Programme (Strat BoI LP) [Financial Evaluation]	A balance of investment tool, investigating the cost effective balance of Force Elements and enablers required to undertake the full range of required military operations, as defined in MoD strategic guidance. (A Force Element is a MOD term to describe an appropriate collection of Trained Equipped Personnel, such as a Battalion, Ship Platform or Air Force Element (Aircraft or Squadron).) It allows the excess or deficit in the force structure to be assessed, ensuring that in the core force is utilised in an appropriate manner prior to new force elements being 'bought in'/ suggested as required. Can explore 'what if' scenarios in relation to areas such as cost or capability.	Provides input to capability and force structure planning decisions. One of the key tools that is used across the whole force (rather than for a particular service or capability area (e.g. Combat Air)). Used as guidance for Decision Makers not to provide definitive answers.	Developer testing, internal peer review, external peer review, version control, external audit, governance, transparency, assessment of fitness for purpose.	•	•	•	•		•		•		•
MOD	FLEETFLOW Maritime Logistics Simulation [Procurement & Commercial]	Simulates movement of fuel, food, stores and personnel around a deployed maritime Task Group. Shows over time how the fuel status of ships' changes and which (if any) ships fall below a certain level.	Previously used to support defining requirements in terms of cargo capacity of future MARS Tanker. Likely to be used to understand future requirements of maritime logistic capabilities.	Developer testing, peer review, version control, internal audit, external audit.	•	•		•	•	•	•	•		•
MOD	SCATMAN Stochastic procurement model In-house spreadsheet model [Procurement & Commercial]	Determines total aircraft fleet buy sizes. Assessment of buy profiles and their ability to meet policy levels.	Drives key funding decisions (numbers and buy profiles) of Joint Combat Aircraft. Impacts UK industrial share (Composite Share Ratio (CSR)) within the Joint Strike Fighter program.	Developer testing, internal peer review, version control, internal audit, external audit.	•	•		•		•		•		•
MOD	THREEDIM Stochastic simulation model Developed in-house [Procurement & Commercial]	The model is a naval battle simulation that is used to compare the effectiveness of weapon and sensor systems, primarily those fitted to Royal Navy ships and helicopters.	Model has been used to support a number of MOD procurement programmes since the 1990s.	Developer testing, peer review, version control, internal audit, external audit.	•	•		•	•	•	•	•		•
MOD	Assessment Tool for Land Systems (ATLAS) stochastic model - a combat simulation which models Army vehicle and personnel interactions. [Procurement & Commercial]	ATLAS is an in-house, decision support model used to understand the possible outcomes of British Army operations at the Battlegroup level of command, and below i.e. down to few on few vehicles. ATLAS represents individual vehicles platforms (including main battle tanks (MBT) and other armoured fighting vehicles (AFVs)) and personnel (infantry teams of two and/or vehicles crews/passengers) that operate within, or have influence over, Battlegroup and below operations. It is able to represent the effects of weapons on individual targets very well and can be used to estimate the effect of, for example equipment options, on military effectiveness through changes in casualty numbers, and damaged or destroyed MBT/AFV. ATLAS uses data from performance level models such as MAVKILL (a vulnerability/lethality model which generates Single Shot Kill Probabilities) and ACQUIRE (a Surveillance and Target Acquisition model which generates probabilities of detection). These models (and others) which provide data for ATLAS are themselves subject to a process of verification and validation. In terms of the model hierarchy within Land Battlespace Systems department ATLAS sits, (in terms of aggregation and structures i.e. as a Battlegroup Level combat simulation) above CAEn (Coy level wargame and simulation) and below WISE (a brigade level wargame). It is feasible to develop a brigade level scenario which can then be modelled at different levels of aggregation i.e. battlegroup (ATLAS) and Coy/Platoon (CAEn). ATLAS is not in constant use but is unique in that it provides the only detailed battlegroup level modelling capability.	ATLAS has been used for assessing the impact of differing aspects of the land battlespace (e.g. mounted weapon systems, artillery/armour support, and ISTAR (Information, Surveillance, Target Acquisition and Reconnaissance) assets) and their impact on the mounted and armoured close combat battle. This includes advice to support procurement decisions, often via Combined Operational Effectiveness Investment Appraisals (COEIAs). Examples of ATLAS use include support to Battlegroup Thermal Imager (BGTI), Future Rapid Effects System (FRES), and Light Forces Anti-tank Guided Weapon (ATGW) procurement, WARRIOR Capability Sustainment Programme (WCSP), Mounted Close Combat (MCC) research activities (e.g., LAser Homing Anti Tank (LAHAT) ATGW on Challenger 2). ATLAS is not in constant use but is unique in that it provides the only detailed battlegroup level modelling capability.	Developer testing, peer and military user review, version control, internal audit, external audit.	•			•		•		•		•
MOD	MAVKILL [Procurement & Commercial]	MAVKILL is an in house model for use in the land domain to represent penetrative weapon / target interactions. This process is known as Vulnerability and lethality (V/L) modelling. Calculates effectiveness of penetrative weapons against land based mobile and relocatable targets (e.g. armour vehicle, other military vehicles and military personnel). The results are termed weapon lethality when looking from the weapons perspective and target vulnerability when looking from the target's perspective. The key outputs include: loss of target capability to perform key roles, likelihood that the armour is perforated by the attacking munition, indications of human incapacitation.	Provided performance metrics that are used directly in support of MOD procurement decisions for weapons and platforms. Provides underpinning performance data for weapons lethality and target vulnerability to Operational Analysis (OA) models that support Combined Operational Effectiveness & Investment Appraisals (COEIAs), balance of investment decisions, Tactical Engagement Simulations, etc. Also provides data for use in subsystem research activities. Results are also supplied to industry in support of MOD research and/or procurement activities.	Internal developer testing, Peer review, version control, internal audit, external audit.	•	•	•	•	•	•	•	•		•

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MOD	Close Action Environment (CAEn) Stochastic Military Operational Analysis Tool [Procurement & Commercial]	CAEn is an in-house, decision support model used to understand the possible outcomes of British Army operations at the infantry Company /armoured Squadron level of command, and below i.e. down to small teams of personnel. CAEn is also made available to allies (Canada, Australia, Netherlands, US) for use within their Defence decision support organisations.CAEn represents individual soldiers, weapons systems and vehicles (including main battle tanks (MBT) and other armoured fighting vehicles (AFVs) that operate within, or have influence over, Company/Squadron Group operations. It is able to represent the effects of weapons on individual targets very well and can be used to estimate the effect of, for example equipment options, on military effectiveness through changes in casualty numbers, and damaged or destroyed MBT/AFV. One of CAEn's key strengths is that it can be used to wargame the operation in question and therefore takes into account organisation and tactics to understand how soldiers, their equipment, and their vehicles can be used to best effect given the nature of the task, the terrain, the enemy, and the presence of other groups such as civilians or insurgents. In addition, it also uses monte-carlo simulation to test the sensitivity of the outcome to changes in particular parameters so as to better understand the key factors in achieving successful outcomes. CAEn's use extends well beyond warfighting operations and it can be used to consider operations other than war, insurgency, special forces, and homeland security tasks (including aspects of policing) within the UK. CAEn's key outputs are whether the Group or Team achieved its mission and tasks, and at what cost in terms of injured/killed personnel and/or damaged/destroyed equipment and vehicles. Time taken and the occurrence of key events and decision points are also outputs. In short, CAEn allows the user to understand the key factors associated with mission success and to explore organisational, doctrinal, and equipment options that, for example, are likely to minimise casualties or offer improved value for money, minimise costs, and combinations of these things.	CAEn has been extensively used for assessing the impact of differing aspects of the land battlespace (e.g. dismounted weapon systems, artillery/armour support, and ISTAR (Information, Surveillance, Target Acquisition and Reconnaissance) assets) and their impact on the close combat battle. This includes advice to support procurement decisions, often via Combined Operational Effectiveness Investment Appraisals (COEIAs). Examples of CAEn use include support to Future Integrated Soldier Technology (FIST) and Anti-Structure Munitions (ASM) procurement, Dismounted Close Combat (DCC) research activities, Support to Operations, and support to Other Government Department security activities. CAEn is currently in consistent use and demand.	Developer testing, Peer and military user review, version control, internal audit, external audit.	•	•	•	•	•	•	•	•		•
MOD	Joint Intelligence Model (J2M) ISTAR systems simulation at the Operational level [Procurement & Commercial]	J2M creates a graph of ISTAR systems and processes to represent the enterprise. Messages are passed around the graph and actioned appropriately, in order to understand the flow of ISTAR information used to answer Intelligence Requirements (i.e. questions). J2M is used to calculate future capability impacts of ISTAR systems in terms of numbers of Intelligence Requirements satisfied, to provide input into the Value axis for VfM appraisals.	Has been (and is planning to be) used to support Initial Gate/Main Gate decision points for various ISTAR systems procurement.	Developer testing, Peer review, version control, internal audit, external audit, ongoing model development.	•	•		•	•	•	•	•	•	•
MOD	NGEC Programme [Financial Evaluation]	The Single Statement of Need (SSON) for the Next Generation Estate Contracts (NGEC) Programme was defined at Initial Gate Business Case (IGBC) and is: "To maintain, improve and change estate infrastructure, and associated management activities, so that the infrastructure is sustainable, fit for purpose, statutory and mandatory compliant to meet and support current and future operational requirements." To achieve this, the NGEC Programme will need to identify the most cost effective mix of estate procurement vehicle(s) to meet these future needs of Defence, undertake their procurement and ensure that there is a seamless transition of service delivery from the current contracts to the new contracts.	The driving force of NGEC Programme is to procure a new suite of contracts to replace: first the existing five Regional Prime Contracts (RPC) in Great Britain (GB) plus the two equivalent contracts in Northern Ireland (NI); second the Training Estate Prime Contract in GB and equivalent in NI; third the England & Wales Housing Prime Contract (HPC); and fourth the current estate arrangements for United States Visiting Forces. These contracts will cover the delivery of maintenance, minor new works and existing training estate and housing services, plus various possible extensions in scope. The Programme is also delivering a suite of framework contracts for capital works. At Contract Award each contract comprises Core Services to provide the minimum "keep me safe keep me legal" service for the estate and mandated corporate and management reporting requirements. During the operation of the contract the Authority may request additional services over and above those provided within the Core Service. Additional Services may be requested to rectify failures the repair cost of which exceed the core service value; for additional works to cover life cycle replacement; for additional works to produce a condition improvement of an asset, or for minor new works generally up to £100k but exceptionally up to £3.93M. The Authority makes no guarantee that Additional Services will be awarded.	IGBC, IN, RN, MGBC. CSDD review 1 and 2 Red Team Reviews for each project OGC Gateway Review 0 for the NGEC Programme (3 completed to date on a rolling programme). For the RP, NHP and NTEP Projects OGC Gateway Review 2 to 5 will apply. IAAP for the NGEC Programme and its projects DTP Tier 1 Quarterly Reports CAAS Interim Progress Reports CAAS independent review of: NGEC Schedules and Scheduled Risk Register; Level 0 Programme Programming Delivery Committee, Programme Board and DIO-IAC approvals.	•	•	•	•	•			•		•
MOD	DIO NGEC EVALUATION STRATEGY [Procurement & Commercial]	The tender will identify the "Most Economically Advantageous Offer" in accordance with Regulation 30 of the Public Contracts Regulations 2006 and JSP 507[1]. Tenders will be evaluated on the basis of Tendered Prices and responses to Quality Questions and then compared on a value for money (VfM) basis.	Identifies the value for money tender considering the lowest tender of the minimum compliant tender and any additional value by tenders who offer a higher quality solution.	Development, peer review and endorsement of methodology documents and Master Data Assumption Lists - including DASA-DESA, NGEC Programme Board and Delivery Committee review. Also Independent review (CAAS) of methodology and values for estimates used. Development of estimate involved NGEC and current delivery staff, TU consultation, independent review (CAAS) and Independent Peer Review (including MAS(A) and non-NGEC Finance staff)	•	•	•	•		•		•		•
MOD	DIO NGEC SHOULD COST MODEL [Financial Evaluation]	Estimates the most likely cost of a Contractor delivering the Core Services including Land Management Services (LMS) in the RPs and NTEP, and Occupancy Management Services, LMS, Defence Accommodation Services (DAS) and Void Preparation and Move Appointments for NHP. Includes Three Point Estimates and Risk Modelling Includes half year mobilisation period, 5 year full service contract period, option to extend up to further 5 years	The annual budget across the range of contracts is some £500m.	Development, peer review and endorsement of pricing methodology documents and Master Data Assumption Lists - including DASA-DESA, NGEC Programme Board and Delivery Committee review. Also submitted for OGC Gateway Review and Commercial Scrutiny and Due Diligence (CSDD) review Independent review (CAAS) of methodology and values for estimates used in the Should Cost Model Development of cost model including V&V, internal review and independent review by external QSs, independent Peer Review (including MAS(A) and non-NGEC Finance staff) and DASA-DESA review.	•	•	•	•		•		•		•
MOD	DIO NGEC WOULD COST MODEL [Financial Evaluation]	Estimate of the cost to deliver the VFMB activities through In-House Delivery (VFMB for Land Management Services in the RPs and NTEP, VFMB for Occupancy Management Services in NHP). Includes Three Point Estimates and Risk Modelling 10.5 Time Horizon - half year mobilisation period, 5 year full service contract period, option to extend up to further 5 years.	The annual budget across the range of contracts is some £500m.	Development, peer review and endorsement of methodology documents and Master Data Assumption Lists - including DASA-DESA, NGEC Programme Board and Delivery Committee review. Also Independent review (CAAS) of methodology and values for estimates used. Development of estimate involved NGEC and current delivery staff, TU consultation, independent review (CAAS) and Independent Peer Review (including MAS(A) and non-NGEC Finance staff).	•	•	•	•		•		•		•
MOD	DIO NGEC INVESTMENT APPRAISAL [Procurement & Commercial]	Net Present Value (NPV) analysis of the costs of each option - bidder prices, should cost estimate, would cost estimate and baseline. Includes Risk Modelling, Sensitivity Analysis and Optimism Bias analysis 10.5 Time Horizon - half year mobilisation period, 5 year full service contract period, option to extend up to further 5 years.	The annual budget across the range of contracts is some £500m.	Development, peer review and endorsement of methodology documents and Master Data Assumption Lists - including DASA-DESA, NGEC Programme Board and Delivery Committee review. Also submitted for OGC Gateway Review and Commercial Scrutiny and Due Diligence (CSDD) review Independent review (CAAS) of methodology and values for estimates used in the IA Cost Model Development of cost model including internal review, independent Peer Review (including MAS(A) and non-NGEC Finance staff) and DASA-DESA review.	•	•	•	•		•		•		•
MOD	Strategic Business Partner Financial Baseline [Procurement & Commercial]	Provides the financial baseline against which the VFM of bids for the Strategic Partner Procurement will be judged. Calculates if VfM and affordability criteria are satisfied for each bid or variant thereof. Calculates PV of contract payments and confirms this is below the Public Sector Comparator and in real terms below affordability limit. Calculates over whole of contract life (10 years).	Total projected contract value has been advertised as £400M over 10 years. The model covers all DIO costs which total over £30 Billion over the same period.	The model has been generated by Deloitte under contract to DIO. Internal peer review by MOD staff. Version and configuration control is in place. Independent external Financial Due Diligence has been undertaken by Ernst and Young and will be offered to bidders as 3rd Party Due Dilligence.	•	•	•	•		•	•	•		•
MOD	DE&S Networks - TRUNK & FALCON Projects [Financial Evaluation]	Sets Whole Life Cost of Project (Phase 1) Sets budget for In year and future funding. Key outputs include the application of: - VAT - Inflation - Risk (analysed/reviewed monthly and model updated quarterly).	This model underpins one of the key Projects monitored at Board level by DE&S 1. Assists with Value for Money, ensuring the Project is delivered on time with risks addressed in an appropriate manner.	Internal review/validation Main contract milestone based Internal 1* review on annual/quarterly basis, internal review/validation by delivery lead, Networks FC and Networks TL In line with JSP507 Guidelines CAAS developing Model, Audited by CAAS NAO - inc Major project Reviews Internal monthly review by Head of Dept, Quarterly review by DG Res, Relevant Chief of Materiel and Front Line Command Customer via QRPC.	•	•		•	•	•	•	•		•

Dept	Model name and type	Description	Why model is Business Critical	Summary of QA	Developer Testing	Internal Peer Review	External Peer Review	Use of Version Control	Internal Audit	Quality Assurance Guidelines	External Audit	Governance	Transparency (published results)	Periodic Review
MOD	Beyond Visual Range Air to Air Missiles Project Team [Financial Evaluation]	Forecasts the costs of through-life support for the Project.	This model underpins one of the key Projects monitored at Board level by DE&S 1. Informs Project approvals and the Annual Budgeting Cycle.	Modelling Best Practice Standards Review within PT, with DE&S Subject Matter Experts and assurance and scrutiny leads.	●	●		●						●
MOD	FAST Project Team - Typhoon - Predict [Forecasting]	Risk Model, Including a 3 point estimate of uncertainty, cost and schedule risk.	This model underpins one of the key Projects monitored at Board level by DE&S 1. Drives key funding decisions 2. Enables prioritisation of future defence programmes key funding and Investment Appraisal decisions.	Modelling best practise techniques (as per AOF) applied PT review by delivery, commercial and finance leads Verification and Validation of the model (to JSP507/Smart Approvals standards) CAAS independent review carried out prior to IAC submission JSP 507, Smart Approvals Internal Governance process JP507 Standards.	●	●		●	●	●		●		●
MOD	FAST Project Team - Typhoon T3 Cost Model [Financial Evaluation]	A model to estimate the Whole Life Cost of a Project. Includes a 3 point estimate of uncertainty, cost and schedule risk. Key Outputs include application of: - VAT - Inflation - Exchange Rates.	This model underpins one of the key Projects monitored at Board level by DE&S 1. Drives key funding decisions 2. Enables prioritisation of future defence programmes key funding and Investment Appraisal decisions.	Modelling best practise techniques (as per AOF) applied PT review by delivery, commercial and finance leads Verification and Validation of the model (to JSP507/Smart Approvals standards Subject to full IAC and CAAS assurance reviews CAAS ICE JSP 507, Smart Approvals Internal Governance process JP507 Standards.	●	●		●	●	●		●		●
MOD	DE&S Air Support - A400M Project Team [Forecasting]	Originally used to inform the initial budgets for the procurement and In Service Support phases of the contract. Now used exclusively to provide spares data (cost, mean time between repairs and serviceability) with which to populate In-service Support Solution Investment Appraisal models for the A400M.	This model underpins one of the key Projects monitored at Board level by DE&S 1. Provides robust and accurate spares data from which ISS major funding decisions are be made.	Model based on best financial modelling practice Reviewed by Prime Contractor Review by the Nations included in the A400M Programme Version control embedded in naming convention. CAAS ICE produced to compare and verify project costings JSP 507 & Treasury Green Book & Smart Approvals V10.2 Reviewed quarterly as part of a QRPC.	●	●	●	●	●	●		●		●
MOD	Lynx Wildcat Helicopter [Financial Evaluation]	Whole Life Cost Estimations of Project, includes 3 Point estimates of Cost and Uncertainty. Key Outputs include: - VAT - Inflation - Exchange Rates. Cost Model financial data was used to support the Investment Appraisal to determine likely project costs and Option ranking. Cost model data was used to inform the approved project costs and Value For Money statement made in the Main Gate business case.	This model underpins one of the key Projects monitored at Board level by DE&S 1. Drives key funding decisions for the Programme to proceed and allocated funding.	Modelling best practice standards Quarterly peer review by DG Res, Chief of Materiel & Front Line Command as per QRPC independent CAAS Verification and Validation process in accordance with JSP507 & Smart Approvals As per modelling best practice standards CAAS - Internal audit - Verification and Validation JP507 Quality Assurance Guidance Followed	●	●		●	●	●		●		●
MOD	FAST Project Team - Typhoon - Foresight [Forecasting]	A model to estimate the Whole Life Cost of the Project.	This model underpins one of the key Projects monitored at Board level by DE&S 1. Drives key funding decisions 2. Enables prioritisation of future defence programmes key funding and Investment Appraisal decisions.	Modelling best practise techniques utilised PT review by delivery, commercial and finance leads CAAS independent review carried out prior to IAC submission JSP 507, Smart Approvals standards and peer reviews The model will be reviewed at key lifecycle dates routinely (Typically Budget Setting Cycle Milestones).	●	●		●	●	●		●		●
MOD	Type 45 Destroyer SUPPORT Programme [Financial Evaluation]	Primary Use: To Inform Main Gate Business Case Current Use: Comparison of actual costs versus original plan.	This model underpins one of the key Projects monitored at Board level by DE&S 1. Critical for Main Gate approved in Jan 2009. 2. Is a key piece of corporate historical Knowledge to inform next phase of T45 support.	Originally developed by independent contractor and further developed by ESCIT. Project Team Common sense and detail review of outputs Model is version controlled by industry CAAS at main decision points In accordance with AOF Guidelines (JSP507) MOD Scrutiny at main decision points, CAAS at main decision points.	●	●		●	●	●		●		●
MOD	FAST Project Team - Typhoon FCP1 Cost Model [Financial Evaluation]	A model to estimate the Whole Life Cost of the Project. Includes a 3 point estimate of uncertainty, cost and schedule risk. Key Outputs include application of: - VAT - Inflation - Exchange Rates.	This model underpins one of the key Projects monitored at Board level by DE&S 1. Drives key funding decisions 2. Enables prioritisation of future defence programmes key funding and Investment Appraisal decisions.	Developer testing - All Forecasting Models go through a Verification and Validation Process in accordance with JSP507 & Smart Approvals PT review by delivery, commercial and finance leads. To JSP507/Smart Approvals standards CAAS independent review carried out prior to Investment Appraisal Committee (IAC) submission Internal Governance process, JP507 Standards The model will be reviewed at key lifecycle dates routinely (Typically Budget Setting Cycle Milestones).	●	●		●	●	●		●		●
MOD	DII/F Deployed Services - Land Implementation (2B) [Financial Evaluation]	Model estimates Whole Life Cost of each Project increment i.e. the potential likely cost of the purchase based on contractor information.	This model underpins one of the key Projects monitored at Board level by DE&S 1. Drives key financial decisions 2. Prime financial document to support contract.	Developer tested by private contractor Review of results by Financial Controller OGC Gateway 3 review All models are configuration controlled, Reconciliation between different versions to confirm changes V&V performed by CAAS Private contractor guidelines followed Quarterly review by DG Res, Relevant Chief of Materiel and Front Line Command Customer via Quarterly Review of Project Costs.	●	●	●	●	●	●		●		●
MOD	Successor Platform Cost Model (includes Next Generation Nuclear Propulsion Plant (NGNPP) costings) [Financial Evaluation]	Model estimates the Whole Life Cost of the Project. It includes 3 Point Estimates of Uncertainty. Costed Risk is then applied and Monte Carlo produces a 10:50:90 output costing Other Key Outputs include: - VAT - Inflation.	This model underpins one of the key Projects monitored at Board level by DE&S 1. Drives heavily scrutinised costings for a high profile project, e.g. Quarterly Review of Programme Costs, Annual Budgeting Cycle, Review Notes, Major Project Review costings & Government Major Project Portfolio 2. Supports the delta explanations between current costings, previous costings and delta to White Paper.	Modelling Best Practice Techniques are applied and were initially developed by Deloitte consulting. Comprehensive User Guide of how the model operates is available Reviewed after each iteration by the Financial Controller, Team Leader and other Key Project Management personnel The model was V&Vd by an external contractor as part of the initial gate submission The model is configuration controlled, delta's between each iteration are reviewed and documented V&V conducted during 2010 for our Initial Gate approval Private contractor guidelines followed NAO have reviewed our Cost Model which supported our Planning Round submissions Quarterly review by Director Submarine's Office.	●	●	●	●	●	●	●	●		●
MOD	Joint Sensor & Engagement Networks (JSENS) Delivery Team - Network Enabled Airspace Defence Surveillance (NEADS) [Financial Evaluation]	The model estimates the Whole Life Acquisition costs of the NEADS Programme, producing Minimum, Most Likely & Max costs (risk moderated & including uncertainty) both at constant & outturn costs. Includes escalation/VAT etc.).	This model underpins one of the key Projects monitored at Board level by DE&S 1. The model is critical to support NEADS Main Gate submission & to facilitate robust costings information to support the Annual Budget Cycle. 2. This model needs to be developed to support the Investment Appraisal Value for Money process in selecting the preferred bidder for the Demonstration & Manufacture (D&M) stage of the project.	CAAS Output Forecast Model developed and tested in house by subject matter experts Cost Model input data peer reviewed by modeller Line Management. Baseline Output Forecast Model cost Model configuration control is documented within the model. NEADS cost model updates maintained within MOSS via version updates Verified by CAAS V&V process. Validation completed through CAAS Peer review Reviewed via CAAS Critical Task Review and Output Assurance Review process. Head of Profession - Ensure compliance through critical task reviews and output assurance reviews to JSP507 standards When the model is changed it will pass through Verification and Validation and Change Control Processes.	●	●		●	●	●				●

Dept	Model name and type	Description	Why model is Business Critical	Summary of QA	Developer Testing	Internal Peer Review	External Peer Review	Use of Version Control	Internal Audit	Quality Assurance Guidelines	External Audit	Governance	Transparency (published results)	Periodic Review
MOD	Warrior Armoured Vehicle Cost model [Financial Evaluation]	Estimates the Whole Life Cost of development, acquisition and support through to 2040. Outputs selected confidence levels based on input uncertainty (3 point estimates) and analysed risk (cost and schedule). Includes application of VAT, various specific Inflation indices as applicable Scope covers: - Equipment Procurement - Equipment Support - Resource Departmental Expenditure Limits (RDEL) - Capital Departmental Expediture Limits (CDEL) - Industry costs and other costs such as Defence Line of Development (DLOD) costs. Outputs are in a format to allow input into Planning Budgeting & Forecasting System (PB&F) for Annual Budgeting Cycle bids. Previously used to calculate Value for Money of bids at Net Present Value (NPV) for Investment Appraisal.	This model underpins one of the key Projects monitored at Board level by DE&S 1. Drives key funding decisions. 2. Enables prioritisation of future defence programmes key funding. 3. Contributes to options analysis to inform value for money / affordability decisions. 4. Enables accurate and realistic budget setting through the ABC process.	Private Contractor testing and review of the model follows a process within the ISO 9001 framework Project team reviews of model requirements and scope, input data (including coherence with Third Order Assumptions), risks and schedule data V&V conducted by CAAS with reports produced Model is Configuration Controlled as per Modelling Best Practice and MOD standards. JSP507, Smart Approvals Guide and MOD Planning Round Guidance adhered to. Reviewed quarterly as part of a Quarterly Review of Project Costs review by Director General Resources, relevant Chief of Materiel and Front Line Command Customer.	●	●		●	●	●		●		●
MOD	Scout Vehicle Cost Model [Financial Evaluation]	Estimates the Whole Life Cost of development, acquisition and support of Scout Vehicle (approximately 50 years). Outputs at selected confidence levels based on input uncertainty (3 point estimates) and analysed risk (cost and schedule). Includes application of VAT, various specific Inflation indices as applicable, Variation of Price on fixed prices, Retail Price Index (RPIX), Foreign Exchange Rates (FOREX). Scope covers: - Equipment Procurement - Equipment Support - Resource Departmental Expenditure Limits (RDEL) - Capital Departmental Expenditure Limits (CDEL) - Industry costs and other costs such as Defence Line of Development (DLOD) costs. Outputs are in a format to allow input into Planning Budgeting & Forecasting System (PB&F) for Annual Budgeting Cycle bids. Previously used to calculate Value for Money of bids at Net Present Value (NPV) for Investment Appraisal.	This model underpins one of the key Projects monitored at Board level by DE&S 1. Drives key funding decisions. 2. Enables prioritisation of future defence programmes key funding. 3. Enables options analysis to inform value for money / affordability decisions. 4. Enables accurate and realistic budget setting through the ABC process.	Modelling Best Practice Techniques are utilised Project team reviews of model requirements and scope, input data (including coherence with Third Order Assumptions), risks and schedule data V&V conducted by CAAS with reports produced Model is Configuration Controlled as per Modelling Best Practice and MOD standards. JSP507, Smart Approvals Guide and MOD Planning Round Guidance adhered to National Audit Office review early last year Reviewed quarterly as part of a Quarterly Review of Project Costs review by Director General Resources, relevant Chief of Materiel and Front Line Command Customer.	●	●		●	●	●	●	●		●
MOD	Military Afloat Research & Sustainability (MARS) Tanker [Procurement & Commercial]	Identifies the preferred procurement solution. Profiles the cost of preferred solution. Costs adjusted for risk and uncertainty and modelled in Net Present Value / outturn and cash terms.	This model underpins one of the key Projects monitored at Board level by DE&S 1. Drives key funding decisions. 2. Enables costing of options. 3. Enables options analysis to inform value for money decisions.	Continuous development of model with regular reviews by CAAS and project team Delivery reviewed in accordance with the Future Shipping Business Processes which was part of the Afloat Support Quality Management System Externally reviewed by accredited independent consultant's review of ISO accreditation Model verified by CAAS. Model developed and verified by Private Contractor with version control. Within DE&S model and data verified and validated in accordance with JSP507 smart approvals standard MoD governance: Business Case Review Board, Investment Appraisal Committee. Regular task reviews with Independent Contractor and CAAS.	●	●	●	●	●	●				●
MOD	Submarine Operating Centre - Nuclear Propulsion Project Team [Financial Evaluation]	A model to estimate the Whole Life Cost of the Project. Includes a 3 point estimate of uncertainty, cost and schedule risk. Key Outputs include application of: - VAT - Inflation.	This model underpins one of the key Projects monitored at Board level by DE&S 1. Drives key funding decisions 2. Essential to delivering business plan objectives. 3. Enables options analysis to inform value for money decisions.	Modelling Best Practice Techniques are utilised Reviewed regularly by Delivery Lead, Via an Output Assurance Review Strategic Partner review (Rolls-Royce are joint owners of the Model) Verification and Validation by CAAS All Forecasting Models go through a Verification and Validation Process in accordance with JSP507,Smart Approvals & Modelling Best Practice - By CAAS All models are Configuration Controlled as per Modelling Best Practice and R-R/MOD standards The model will be reviewed at key lifecycle dates routinely (Typically Budget Setting Cycle Milestones and at least annually).	●	●	●	●						●
MOD	Chinook Helicopter New Buy (NB) [Financial Evaluation]	Whole Life Cost Estimations of project, includes 3 Point estimates of Cost and Uncertainty. Key Outputs include: - VAT - Inflation - Exchange Rates. Cost Model financial data is used to support the Investment Appraisal to determine likely project costs and Option ranking as well as to inform the affordability and Value for Money Statement in the Main Gate Business Case. The model was used to support the Investment decision only and is relevant for the period FY10/11 to FY39/40.	This model underpins one of the key Projects monitored at Board level by DE&S 1. This model was business critical to inform the Main Gate investment Decision, it also supported option costing during the Strategic Defence Spending Review.	CAAS developed Model in line with JSP507 & Smart Approvals standards (and Modelling Best Practice) A Cost Team was set up within the project team to review the model. Team included an independent member from CAAS OGC Gateway review was conducted providing an Independent external review V&V by CAAS Cost Model is Configuration Controlled as per modelling Best practise and MoD Standards JP507 Quality Assurance Guidance Followed Quarterly peer review by Director General of Resources, Chief of Materiel & Front Line Command as per Quarterly Review of Project Costs CAAS Review of model.	●	●	●	●	●	●		●		●
MOD	CIPHER Cost Model [Financial Evaluation]	A model to estimate the Whole Life Cost of the Project. Includes a 3 point estimate of uncertainty, cost and schedule risk. Risk analysed/reviewed monthly Used for: - Investment Appraisal (discounting at Treasury Discount Rates) - Affordability (including inflation and VAT as advised by DASA/DESA and MOD VAT Policy, no foreign exchange).	This model underpins one of the key Projects monitored at Board level by DE&S 1. Drives key funding decisions 2. Enables options analysis to inform value for money decisions.	The cost model is based upon modelling best practice techniques. Model developed to JSP507 Smart Approvals standards. Versions control assured by saving daily and cross checking against previous versions CAAS Estimating Assurance & Verification and Validation performed Quarterly review by Director General of Resources, Relevant Chief of Materiel and Front Line Command Customer via Quarterly Review of Project Costs.	●	●		●	●	●		●		●
MOD	Spearfish Upgrade - (TTH Project Team) [Financial Evaluation]	A model developed to estimate the Whole Life Cost of the project and establish affordability and Value for Money.	This model underpins one of the key Projects monitored at Board level by DE&S 1. Drives key funding decisions 2. Enables options analysis	Modelling best practice techniques are utilised Regular internal reviews by Delivery Lead. Regular comparison of models by CAAS and Project Team Model reviewed by Private Contractor and Project Team at the Quarterly Project Review CAAS internal audit of the model V&V to JSP507 standards. The Private Contractor model follows their corporate guidelines and shared through BAe Route to Service process Contractor owned model reviewed by contractor and Project Team at the Quarterly Project Review.	●	●		●	●	●		●		●
MOD	Beyond Visual Range Air to Air Missiles Project Team [Procurement & Commercial]	Forecasts the scale of the spares procurement required to conduct a missile mid-life life extension.	This model underpins one of the key Projects monitored at Board level by DE&S 1. Informs the uncommitted Whole-Life Cost forecast and inventory management strategy.	Equipment Support Continual Improvement Team tested model with other weapons PTs during development. Proven through use with other teams Partner Nation Subject Management Experts reviewed the structure and outputs of the model for realism. Internally audited by CAAS via V&V process Multi-use model used across many projects and so constantly being assessed through use.	●	●		●	●	●		●		●

Dept	Model name and type	Description	Why model is Business Critical	Summary of QA	Developer Testing	Internal Peer Review	External Peer Review	Use of Version Control	Internal Audit	Quality Assurance Guidelines	External Audit	Governance	Transparency (published results)	Periodic Review
MOD	SPEAR 3 Capability [Financial Evaluation]	A model to estimate the Whole Life Cost of a Project. Includes a 3 point estimate of uncertainty, cost and schedule risk. Key Outputs include: - Cost at 10/50/90% - Whole Life Costs (WLC) at both Net Present Value and Outturn.	This model underpins one of the key Projects monitored at Board level by DE&S 1. Drives key funding decision.	Model is based on best financial and modelling practice Internal peer review via compliance with Internal assurance process Independent Assurance review and audit conducted by CAAS - V&V to JSP 507 standards All models are Configuration Controlled as per Modelling Best Practice and MOD standards Verification and Validation of the model (to JSP507 Smart Approvals standards).	●	●		●	●			●		●
MOD	Submarine Dismantling Project [Financial Evaluation]	Model estimates the Whole Life Cost of the proposed options for Submarine Dismantling Project including the do minimum. It includes 3 point estimate of uncertainty, impact of risk and impact of schedule - It can output at Constant Cost, Net Present Value and Outturn Cost - It considers VAT where applicable - There is no exchange rate as all activities must be undertaken in the UK.	This model underpins one of the key Projects monitored at Board level by DE&S Drives key funding decisions Enables prioritisation of future defence programmes key funding and Investment Appraisal decisions Enables options analysis to inform value for money decisions.	CAAS have undertaken substantial developer testing from May 2012 The model is reviewed by key members of the Project Team, including other Submarine Dismantling Project customer CAAS have undertaken V&V and the model has also been reviewed by DASA/DESA and OGC The model is subject to version control, differences between Models are covered by internal review/knowledge share Model QA and Governance complies with JSP507 standards Model underwent initial V&V in Sept 2010, it has since been subject to Quarterly Reviews, the Model was also review by DASA/DESA (Aug 2012) and as part of the OGC Panel (Oct 2012).	●	●		●	●	●		●		●
MOD	Submarine Operating Centre - Production Submarine Project Team [Financial Evaluation]	A model to estimate the Astute programme acquisition cost. Includes 3 point estimates of cost uncertainty, cost risk and schedule risk. Key Outputs include application of: - sensitivity analysis of Inflation - Rates - Spend Profile - Risk impacts. Model provides a risk based output and is capable of providing Min, Max, ML as well as % confidence limits from 0% to 100% dependant on customers requirements. The enterprise version of this model includes forecast and spend data.	This model underpins one of the key Projects monitored at Board level by DE&S 1. Used as a basis to inform the Astute 2011 Review Note and subsequent HM Treasury approval. 2. Used in the Submarine Enterprise Performance Programme Diagnostic Baseline review for the Submarine Portfolio Office at a BAES Maritime Submarines enterprise level.	Developer tested as per DE&S and MOD Guidelines Reviewed by Peers, Delivery Lead and by Head CAAS (Quarterly Review of Project Costs). Verification of the model carried out by independent body (CAAS Cost Forecasting). Validation of input data via internal peer review and by CAAS working with and through Industry. Competence sets provide ability to peer review Version Control is integrated as is a Master Data and Assumption List Output Assurance Reviews ensure QA and compliance with governance standards. CAAS act as the independent body between the Production Submarine PT and Industry. Internal Audit via CAAS V&V Reviewed quarterly as part of Quarterly Review of Project Costs by Director General Resources, relevant Chief of Materiel and Front Line Command Customer.	●	●		●				●		●
MOD	AIRSEEKER Project Team [Financial Evaluation]	Monte Carlo model providing cost estimates for the Procurement and Support project phases to help inform Main Gate Business Case. Includes the outputs from the Project Team risk tool (ARM) to model 3 point estimate of uncertainty, cost and schedule risk.	This model underpins one of the key Projects monitored at Board level by DE&S 1. Informs key funding decisions - Main Gate Approval 2. Supports the annual planning process.	Modelling Best Practice Techniques are utilised Project Team Fighter Ground Attack and Air Support Operating Centre (ASOC) reviews undertaken in line with smart approvals and ASOC issued assurance processes CAAS Independent Cost Estimates produced to compare and verify project costings All models are Configuration Controlled as per Modelling Best Practice and MOD standards. All model QA and Governance is compliant with JSP 507 & Treasury Green Book & Smart Approvals Standards Models are reviewed quarterly as part of the Quarterly Review of Project Costs review by Director G Res, relevant Chief of Materiel and Front Line Command Customer.	●	●		●	●	●		●		●
MOD	DE&S Air Support - A400M Project Team [Financial Evaluation]	Value for Money benchmark (Should Cost Model) generated independently by Industry used for assessment of the Airbus Military In Service Support proposal/tender.	This model underpins one of the key Projects monitored at Board level by DE&S 1. Provides independent cost estimate benchmark with which to assess Value for Money of the supplier proposal when received.	Model based on best financial modelling practice Internally reviewed by BMT internal review, BMT hold MOD accreditation for their internal QA process V&V Certificate 2011-0130 issued 22/11/2011 Version control embedded in the model. Model complies with JSP 507 & Treasury Green Book & Smart Approvals V10.2 Models are reviewed quarterly as part of the Quarterly Review of Project Costs review by Director G Res, relevant Chief of Materiel and Front Line Command Customer.	●			●	●	●		●		●
MOD	DE&S Air Support - A400M Project Team [Financial Evaluation]	Planning the payment schedule of a complex financial and commercial arrangement to include allowances for inflation and Variations of Price (VOP) during the contract term.	This model underpins one of the key Projects monitored at Board level by DE&S 1. Side deal is instrumental in maintaining the affordability of the A400M program as a result of program delays.	Model based on best financial modelling practice Internal peer review by the PT Financial Controller Model was subjected to CAAS formal V&V process Version control is embedded in the model JSP 507 & Treasury Green Book & Smart Approvals V10.2 followed for Governance and QA Models are reviewed quarterly as part of the Quarterly Review of Project Costs review by Director G Res, relevant Chief of Materiel and Front Line Command Customer.	●	●		●	●	●		●		●
MOD	Labyrinth - Defence Intranet Implementation Deployed Services Increment 2C [Financial Evaluation]	Model estimates Whole Life Cost of Increment 2C i.e. potential likely cost of purchase based on contractor information.	This model underpins one of the key Projects monitored at Board level by DE&S 1. Drives key financial decisions 2. Prime financial document to support contract.	Contractor developed model reviewed by contractor, Project Team and Financial Controller Full internal audit (V&V) by CAAS All models are configuration controlled Original Model Reviewed by KPMG as an external reviewer Quarterly review by Director General Resources, Relevant Chief of Materiel and Front Line Command Customer.	●	●		●	●		●	●		●
MOD	Watchkeeper Project Team [Financial Evaluation]	Risk analysis model providing Monte Carlo cost estimates to support investment decisions, latest Review Note and financial planning.	This model underpins one of the key Projects monitored at Board level by DE&S 1. Support decision to inform value for money decisions 1. Drives PT schedule risk analysis, contingency applied as a result of model analysis.	Modelling best practise techniques applied Project Team review by delivery, commercial and finance leads CAAS independent review and estimating assurance carried out prior to Investment Appraisal Committee submission CAAS Verification and Validation internal audit Model controlled though toolset Verification and Validation of the model (to JSP507/Smart Approvals Schedule model internally reviewed monthly.	●	●		●	●	●		●		●
MOD	UK Military Flying Training System (UK MFTS) [Financial Evaluation]	A model to estimate the Whole Life Cost of UKMFTS Package , including options analysis and affordability profile. Includes Monte Carlo analysis of cost uncertainty and risk based on 3-point estimates. Key Outputs include consideration of: - VAT - Inflation - Exchange Rates - Financing costs.	This model underpins one of the key Projects monitored at Board level by DE&S 1. Drives key funding decisions 2. Enables prioritisation of future defence programmes key funding and Investment Appraisal decisions 3. Enables options analysis to inform value for money decisions.	Model developed in accordance with JSP 507, Smart Approvals Standards Internally reviewed by Project Team and joint review of costing assumptions by PT/Contractor project, finance and commercial teams CAAS Independent Cost Estimate & Verification and Validation - Internal audit All models are Configuration Controlled. Verification and Validation of the model (to JSP507/Smart Approvals standards) Financial Assurance and Scrutiny processes ensure regular review.	●	●		●	●	●	●	●		●
MOD	LMAS Project Team - Future Air to Surface Guided Weapon [Financial Evaluation]	A model to estimate the Whole Life Cost of a Project. Includes a 3 point estimate of uncertainty, cost and schedule risk. Key Outputs include: - D&M cost at 10/50/90% - Whole Life Costs (WLC) at both Net Present Value and Out turn.	This model underpins one of the key Projects monitored at Board level by DE&S 1. Drives key funding decision.	Model is based on best financial practice Internal review process within Project Team CAAS peer review and Output Assurance Review. All models are Configuration Controlled as per Modelling Best Practice and MOD standards Standard Service Delivery processes including Critical Task Reviews and Output Assurance Review processes Internal audit - Verification and Validation of the model (to JSP507 Smart Approvals standards) CAAS process owners responsible for review. Provide Assurance report to Business Case Review Board. CAAS Head of Profession - ensure compliance through critical task reviews and output assurance reviews. Also guidance on standardisation and quality.	●	●		●	●			●		●

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MOD	LMAS Project Team - Future Air to Surface Guided Weapon [Financial Evaluation]	A model to estimate the Whole Life Cost of a Project. Includes a 3 point estimate of uncertainty, cost and schedule risk. Key Outputs include: - D&M cost at 10/50/90% - Whole Life Costs (WLC) at both Net Present Value and Out turn.	This model underpins one of the key Projects monitored at Board level by DE&S 1. Drives key funding decision.	Model is based on best financial practice Internally reviewed Via Internal review process CAAS Peer Review model and & internally audit via Verification and Validation All models are Configuration Controlled as per Modelling Best Practice and MOD standards. Verification and Validation of the model (to JSP507 Smart Approvals standards). Quality Management Assurance Team provide Assurance Report to Business Case Review Board. Regular periodic reviews by definition as per modelling best practice, CAAS and QMA Processes.	•	•		•	•	•		•		•
MOD	Future Local Area Air Defence System (FLAADS) - Sea Ceptor Project Team [Financial Evaluation]	A model to provide Net Present Value analysis of selected options of a project. The data output is used in the Investment Appraisal and Business Case of the Sea Ceptor Project.	This model underpins one of the key Projects monitored at Board level by DE&S 1. Informs value for money decision making by providing Risk inclusive Net Present value through life costs of project options.	All models are Configuration Controlled as per Modelling Best Practice and MOD standards. The model will be reviewed routinely at key points of the lifecycle Internal audit by CAAS V&V and peer review by Heads of Profession Verification and Validation of the model (JSP507 Smart Approvals standards) and CAAS Delivery Lead and CAAS Output Assurance Review.	•	•		•	•			•		•
MOD	TTH Project Team - Spearfish Upgrade [Financial Evaluation]	Estimated whole life costs for 3 options of future heavyweight Torpedo capability.	This model underpins one of the key Projects monitored at Board level by DE&S 1. Drives key funding decisions and informed value for money decision.	Modelling best practise techniques used and tested. Independent review at contractors following development Internal review by Delivery Lead CAAS Peer Review & audit via Verification and Validation All models version controlled, and only one final version held once released by contractors Model generated by external contractors so fully tested by them and used on other projects. Model regularly reviewed as per modelling best practice CAAS and Project Team reviews.	•	•		•	•	•		•		•
MOD	T26 Global Combat Ship [Financial Evaluation]	Joint Cost Model includes Equipment Procurement & Equipment Support estimates to T26 and rest of MoD • CAAS maintain the cost model • Data to be used to inform Investment Appraisal in accordance with JSP 507 • 3 Point Estimates are produced (time & cost) validated by CAAS • DASA produce a quarterly inflation report which MoD use to inform estimates.	This model underpins one of the key Projects monitored at Board level by DE&S 1. Model is a key element of the basis for informed decision making on: • Programme, capability, and system selection • Funding • Financial accounting • Performance measuring, review and management • Risk management • Reporting - internal .	Developer tested by CAAS involvement Internally reviewed by Ships Acquisition Client, Project Support and Finance reviews Internal audit by CAAS V&V at main decision points Models is version controlled. Governance and QA as maintained by CAAS to modelling/JSP standards Audited by National Audit Office as part of the Major Project Review (MPR) The model's outputs are used to inform decision making and are an intrinsic part of the performance/cost reported through MPR and therefore in the public domain DE&S Scrutiny: Financial Assurance, CAAS, DASA other stakeholders across LoDs.	•	•		•	•	•	•	•	•	•
MOD	CrowsNest [Financial Evaluation]	Whole Life Cost Estimations of project, includes a 3 Point estimates of Cost risk and Uncertainty. Key Outputs include: - VAT - Inflation - Exchange Rates. Cost Model financial data is used to support the Investment Appraisal to determine likely project costs and Option ranking. Cost model data is also used to inform the affordability position and Value for Money statement made in the Main Gate business case. The Cost Model is used elsewhere within the Operating Centre but will not be publically available, no other organisations currently utilise the cost Model. Model will be used to support the Investment decision only.	This model underpins one of the key Projects monitored at Board level by DE&S 1. Drives key funding decisions 2. Enables prioritisation of future defence programmes key funding and Investment Appraisal decisions 3. Enables options analysis to inform value for money decisions.	CAAS Modelling techniques used along side Historical Trend Analysis and Optimism Bias Internal Audit via CAAS Verification and Validation process in accordance with JSP507 & Smart Approvals Configuration Controlled as per modelling Best practise and MoD Standards Review of Cost Model, data and Internal Audit conducted by DASA DESA in line with JSP 507 and Smart Approvals CAAS Critical Task Review Process and Output Assurance Review process will be applied to this model.	•	•		•	•	•		•		•
MOD	PUMA Life Extension Programme [Financial Evaluation]	Whole Life Cost Estimations of project, includes 3 Point estimates of Cost and Uncertainty. Key Outputs include: - VAT - Inflation - Exchange Rates. Cost Model financial data is used to support the Investment Appraisal to determine likely project costs and Option ranking. Cost model data was also used to inform the affordability position and Value for Money statement made in the business case. The model was used to support the Investment decision only and is only relevant for the period FY 09/10 to FY 22/23.	This model underpins one of the key Projects monitored at Board level by DE&S 1. Drives key funding decisions 2. Enables prioritisation of future defence programmes key funding and Investment Appraisal decisions 3. Enables options analysis to inform value for money decisions	CAAS Modelling techniques used along side Historical Trend Analysis and Optimism Bias Costs were independently assessed by Project Subject Matter experts and Team Leader. CAAS Review & Verification and Validation Developed and controlled as per modelling Best practise and MoD Standards Review of Cost Model, data and Investment Appraisal conducted by DASA DESA in line with JSP 507 and Smart Approvals Models are reviewed quarterly as part of the Quarterly Review of Project Costs review by Director G Res, relevant Chief of Materiel and Front Line Command Customer.	•	•		•	•	•		•		•
MOD	MARSHALL Project Team [Financial Evaluation]	This model consists of a Should Cost Model and a Value for Money Benchmark. The models have been developed with the aid of external financial advisors with inputs from internal MOD Sources. It is now maintained and operated internally The model produces an estimated costs for delivery of Air Traffic Control Services and a separate estimate based on Public Service provision, which constitutes the Value for Money Benchmark. The model covers a 22 year period starting in 2015.	This model underpins one of the key Projects monitored at Board level by DE&S 1. This model will be a core part of the investment appraisal at Main Gate that will determine the preferred bidder for MARSHALL contract.	Developer tested by private contractor Internal peer review of the cost input data including experts from the wider MOD stakeholder community Model developer, Price Waterhouse Cooper (PWC), undertook an independent external peer review The model has been subject to independent audit (CAAS) and separate benchmarking exercises Version Control is used to control the model. Assurances are conducted by the Financial Controller, CAAS and the Scrutiny Community in Main Gate before the output can be used to support the investment decision A CAAS assured independent cost model generates an independent cost estimate ('realistic outturn') in support of the Quarterly Review Process.	•	•	•	•	•	•		•		•
MOD	Strategic Transport & Air to Air Refuelling (STAAR) Project Team [Financial Evaluation]	The Model provides the agreed financial position determined at Contract Financial Close. The model provides annual tariffs for service provision using updated Retail Price Index forecasts provided by DASA DESA.	This model underpins one of the key Projects monitored at Board level by DE&S 1. Provides PFI usage tariffs in accordance with contract terms and conditions. 2. Output is linked to the PFI evaluation model and is used to calculate PFI service cost based on MoD expected usage levels, providing input to the MoD Planning round process.	Evaluation Model output tested for consistency against usage scenarios and costing output from the validated Private Finance Initiative Financial Model Reviewed quarterly by Director General Resources, relevant Chief of Materiel and Front Line Command Customer (QRPC) Internal audit by CAAS, Independent Cost Estimate produced The model is held under MOSS configuration management All development and QA/Governance to JSP 507 & Treasury Green Book & Smart Approvals V10.2 standards.	•	•		•	•	•	•	•		•
MOJ	NOMS Workforce Model. [Planning]	Calculates quarterly estimates of NOMS workforce, leavers, joiners and surplus staff (establishments and HQ).	Drives decisions on recruitment and voluntary exit schemes (including required funding). Also used in planning for prison closures - mainly on determining the proportion of staff that are likely to be able to redeployed.	When the workforce model was developed it was quality assured in a number of ways: firstly the methodology was reviewed by a team in core MoJ to check the approach was fit for purpose, secondly a team of in-house and contracted analysts tested the technical implementation of the model through verification of the code and running a range of scenarios. Finally, historical data was used to validate the output. The output of the workforce model is validated both by comparison with historical data, quality assuring the input data and scrutinising the output for any inconsistencies. The model is continually developed and at each stage the changes are rigorously assured through scenario testing.	•	•	•	•		•		•		•

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MOJ	NOMS Pay Bill Model. [Financial evaluation]	Calculates estimates of future NOMS pay bill (establishments and HQ) based on assumed future workforce and pay and grading structures.	Drives decisions on pay and grading structures and pay policy. Informs negotiations over NOMS budget. Provision of evidence to Prison Service Pay Review Body.	The pay bill model was developed as a replacement to a model that was no longer fit for purpose because it was not able to forecast the pay of a decreasing workforce. The original model was used as the basis to validate the new model with differences in the output being investigated. A team of analysts (both internal and external) also checked the code and ran scenarios to test the model, and used historical data to validate. The output of the pay bill model is validated by rigorously checking the input data and scrutinising the output for inconsistencies, as well as sense checks against simpler spreadsheet calculations.	•	•	•	•		•		•	•	•
MOJ	Civil Representation (Legal Aid) Fund forecasting model. [Forecasting]	Estimate Civil Rep fund spend for current financial year and 4 future years.	Drives funding decisions and informs Budget Allocations & Planning process.	There is ongoing and continual review of forecast against out-turn, ongoing and continual review of inputs, ongoing and continual review of model structure, and regular scrutiny of outputs in other contexts where inconsistencies (if they arose) would be noticed (and could be fed back into the model if found).	•	•		•	•	•		•		•
MOJ	Legal Help fund forecasting model. [Forecasting]	Estimate Legal Help fund spend for current financial year and 4 future years.	Drives funding decisions and informs Budget Allocations & Planning process.	There is ongoing and continual review of forecast against out-turn, ongoing and continual review of inputs, ongoing and continual review of model structure, and regular scrutiny of outputs in other contexts where inconsistencies (if they arose) would be noticed (and could be fed back into the model if found).	•	•		•	•	•		•		•
MOJ	Crime Lower fund forecasting model. [Forecasting]	Estimate Crime Lower fund spend for current financial year and 4 future years.	Drives funding decisions and informs Budget Allocations & Planning process.	There is ongoing and continual review of forecast against out-turn, ongoing and continual review of inputs, ongoing and continual review of model structure, and regular scrutiny of outputs in other contexts where inconsistencies (if they arose) would be noticed (and could be fed back into the model if found).	•	•		•	•	•		•		•
MOJ	Crime Higher fund forecasting model. [Forecasting]	Estimate Crime Higher fund spend for current financial year and 4 future years.	Drives funding decisions and informs Budget Allocations & Planning process.	There is ongoing and continual review of forecast against out-turn, ongoing and continual review of inputs, ongoing and continual review of model structure, and regular scrutiny of outputs in other contexts where inconsistencies (if they arose) would be noticed (and could be fed back into the model if found).	•	•		•	•	•		•		•
MOJ	In-year phased forecast model. [Forecasting]	Estimate phasing of all legal aid fund spend in the remainder of the current financial year.	Drives drawdown requests.	There is ongoing and continual review of forecast against out-turn, ongoing and continual review of model structure, and regular scrutiny of outputs in other contexts where inconsistencies (if they arose) would be noticed (and could be fed back into the model if found).	•	•		•	•	•		•		•
MOJ	Prison Competitions Financial Evaluation Analysis Tool (to be used with Bidder Financial Templates). [Procurement & Commercial]	Calculates whether affordability criteria are satisfied for each procurement. Used to analyse and evaluate bids on the Prisons Competition Programme Phase 2 (PCP2). Calculates Net Present Cost, Price per Prisoner Place etc over a 15 year contract period, and compares pricing information.	High profile services competition.	Developer testing by external consultants. Peer review undertaken internally, version control, internal checking and double checking integral to evaluation models and evaluation process using Standardised Checklist process. Models were tested live with Bidders at each stage of the competition. NPC calculations were fed back to Bidders for checking and sign-off as part of the process. Quality assurance processes were thorough and involved a series of checks an balances including testing of the model on interim submissions to ensure it was fit for purpose.	•	•	•	•		•		•		
MOJ	Prison Cost Analysis. [Financial Evaluation]	Compares running costs of prisons and where relevant, adjusts for population, size, category etc. Key outputs include: - Drivers of cost. - Expected cost.	Feeds into financial planning and estate reform programmes.	The model has been developed following internal guidance on quality assurance including developer testing, internal and external peer review and version control. The Quality Assurance process is used to demonstrate that the model is fit for purpose and has been correctly developed, as specified. Operational and policy leads were engaged in the development of the model to agree assumptions and specification. The model is reviewed on an annual basis and the outputs regularly reviewed by operational and finance experts.	•	•	•	•		•		•		•
MOJ	Prison Estates Model. [Policy Simulation]	Calculates costs/benefits and net present value/cost associated with changes to the prison estate.	Supports decisions about estate reform and capital investment.	The model has been developed following internal guidance on quality assurance including developer testing, internal peer review, sensitivity testing and version control. The Quality Assurance process is used to demonstrate that the model is fit for purpose and has been correctly developed, as specified. Operational and policy leads were engaged in the development of the model to agree assumptions and specification. The model outputs are used to inform high level strategic analysis. Any specific changes to the estate that may follow would be subject to significant additional analysis, scrutiny and governance.	•	•		•		•		•		•
MOJ	Court Estates Model. [Policy Simulation]	Calculates costs/benefits and net present value/cost associated with changes to the court and tribunals estate.	Supports decisions about estate reform and capital investment.	The model has been developed following internal guidance on quality assurance including developer testing, internal peer review, sensitivity testing and version control. The Quality Assurance process is used to demonstrate that the model is fit for purpose and has been correctly developed, as specified. Operational and policy leads were engaged in the development of the model to agree assumptions and specification. The model outputs are used to inform high level strategic analysis. Any specific changes to the estate that may follow would be subject to significant additional analysis, scrutiny and governance.	•	•		•		•		•		•
MOJ	Financial Response Templates for Prisoner Escort and Custody Services Competition (includes Cost Model and Payment Mechanism). [Procurement & Commercial]	Captures all costs from Bidders that would be incurred to provide the Prisoner Escort and Custody Services. Extracts costs and transfers into a payment mechanism. Calculates over whole of contract life (7 years) showing costs year on year, including discounts owing to a learning curve factor. Allows for analysis against affordability limits; for each year of the contract and over the contract term. Identification of the outputs required from the financial analysis of the Financial Response Templates (both Cost Models and Payment Mechanisms) to feed into the BAFO Evaluation Report and Final Business Case.	Prisoner Escort and Custody Services is a business critical service for the Criminal Justice System. Essential to ensuring Bidders commit to costs that are to be incurred when providing the service and used as a baseline in the contract. Essential to ensuring that the Bidder offering the most economically advantageous solution against the Authority's published requirements was selected.	Experts appointed to develop the templates. As part of a live competition these documents were commercially in confidence and could not be released to external sources prior to release to bidders. Internal review and audit consisted of several separate parts of the organisation including procurement, external procurement consultants, analytical services.	•	•		•				•	•	
MOJ	Financial Analysis models for Prisoner Escort and Custody Services Competition. [Procurement & Commercial]	Financial evaluation model to provide like for like comparison of Bidders costs broken down into predefined cost categories. This financial analysis model enables the development of a deeper understanding of what drives Bidders' costs and how they deliver value for money against a baseline, and fluctuating demand patterns, Calculation of the payment mechanism terms, nominal prices and NPCs for every possible combination of award of the 4 Lots to each of the 5 Bidders. (192 possible combinations). Includes developing the mechanisms to test the sensitivity of the price to future changes e.g. volume of prisoners, change in indexation rates etc. Identification of the outputs required from the financial analysis of the Financial Response Templates (both Cost Models and Payment Mechanisms) to feed into the BAFO Evaluation Report and Final Business Case.	Prisoner Escort and Custody Services is a business critical service for the Criminal Justice System. Essential to ensuring Bidders commit to costs that are to be incurred when providing the service and used as a baseline in the contract. Essential to ensuring that the Bidder offering the most economically advantageous solution against the Authority's published requirements was selected.	Experts appointed to develop the model. As part of a live competition these documents were commercially in confidence and could not be released to external sources. Internal review and audit consisted of several separate parts of the organisation including procurement, external procurement consultants, analytical services.	•	•		•				•	•	

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MOJ	Pay bill Forecasting Model In-House use only. [Forecasting]	The model forecasts the pay bill for all staff in MoJ (excluding staff in NOMS) for the next five years under various pay and grading reform strategies. The model calculates the annual 'Increase for staff in Post' and the total pay bill for both the consolidated and non-consolidated increases in pay.	The model is used to develop options for the administration of the two year's of pay restraint. A large proportion of MoJ staff are on contractual terms and conditions and not affected by the pay freeze and pay restraint.	Following MoJ's guidance on quality assurance, the modelling specification, algorithms and assumption base were all agreed by the customer. The development process has included version control, internal and external peer review by analysts, where a test plan was developed; review by developers and customer has included following the test plan, documenting and comparing the results via pen and paper simulation; the data handling processes were also included in the review. Recent modifications to the model need to be fully quality assured - pending this review, developers have completed preliminary analysis of the outputs and general cross checking (sense checking) the results from the first version of the model.	●	●	●	●		●		●		●
MOJ	Prison Projection Model. In-house. [Planning]	Calculates the estimated prison population over ~6 years.	Used in planning the prison estate.	Following internal guidance on quality assurance including developer testing, internal peer review, external peer review, version control. Quality Assurance processes used to demonstrate that the model is fit for purpose and has been correctly developed, as specified. Advisory groups, involving representatives from a wide range of organisations and departments, are engaged in the development of the model. The purpose of these groups is to provide a richer understanding of historical and future drivers of demand (including policy changes where the expected impact has been evaluated), and to help validate the modelling approach and assumptions used. When the methodology used to generate the projections was changed there was external review both of the technical specification and the suitability of the new approach. The QA process is to be completed during each update of the model. Results are published annually.	●	●	●	●		●		●	●	●
MOJ	Driver-based forecasts of Family legal aid certificates. In-house. [Forecasting]	Provides forecasts of family legal aid certificate volumes.	Legal aid certificate forecasts are used by the Legal Services Commission (LSC) for financial planning. They drive the workload forecasts for Legal Aid expenditure on family work.	External review of the legal aid certificates forecasts, and underlying civil eligibility modelling is undertaken by the Legal Services Commission. Additional external review by DWP is planned for civil eligibility modelling. Internal review of modelling civil legal aid eligibility and forecasts by joint MoJ & LSC legal aid modelling technical group and legal aid modelling steering group. Feedback from user testing forms part of ongoing model improvement. Model development follows MoJ's quality assurance guidelines. Use of version control.	●	●	●	●		●		●		●
Ofsted	Maintained schools risk assessment model. [Policy Simulation]	The model predicts Inspection outcomes for schools. Predictions are made in a binary fashion where 0 = good or outstanding, 1= requires improvement or inadequate. The final output is a risk score, between 0 and 1, which represents the probability of an inspection grade being good or outstanding.	The model allows Ofsted to concentrate inspection activity where it is most needed. Inspection volumes do not depend upon the model. However, the model helps Ofsted select schools more effectively than following a purely random or rules based mechanism.	Internal peer review, external peer review, version control, quality assurance guidelines, external audit, investigation of fitness for purpose over the model lifetime.	●	●	●	●		●	●	●		
Ofsted	College risk assessment model. [Policy Simulation]	The model predicts Inspection outcomes for colleges. Predictions are made in a binary fashion where 0 = good or outstanding, 1= requires improvement or inadequate. The final output is a risk score, between 0 and 1, which represents the probability of an inspection grade being good or outstanding.	The model allows Ofsted to concentrate inspection activity where it is most needed. Inspection volumes do not depend upon the model. However, the model helps Ofsted select schools more effectively than following a purely random or rules based mechanism.	Internal peer review, external peer review, version control, quality assurance guidelines, external audit, investigation of fitness for purpose over the model lifetime.	●	●	●	●		●	●	●		●
Ofsted	Work Based Learning risk assessment model. [Policy Simulation]	The model predicts Inspection outcomes for Work Based Learning inspections. Predictions are made in a binary fashion where 0 = good or outstanding, 1= requires improvement or inadequate. The final output is a risk score, between 0 and 1, which represents the probability of an inspection grade being good or outstanding.	The model allows Ofsted to concentrate inspection activity where it is most needed. Inspection volumes do not depend upon the model. However, the model helps Ofsted select schools more effectively than following a purely random or rules based mechanism.	Internal peer review, external peer review, version control, quality assurance guidelines, external audit, investigation of fitness for purpose over the model lifetime.	●	●	●	●		●	●	●		●