CAREERS THROUGH MATHS: GOVERNMENT ADVISOR

JOB DESCRIPTION

A Government Advisor, often known as a Policy Advisor, is a central figure in the development, analysis, and implementation of public policy within the UK. Their primary role is to provide evidence-based recommendations to ministers, senior civil servants, and other decision-makers. On a daily basis, this involves scrutinising complex data, forecasting the outcomes of proposed policies, and evaluating the effectiveness of existing programmes. The work environment is typically fast-paced, located within Whitehall departments such as the Treasury, the Department for Health and Social Care, or the Home Office, and requires close collaboration with colleagues across the Civil Service, external stakeholders, and academic experts.

Key duties include conducting in-depth research to understand a policy issue, such as the economic impact of a new infrastructure project or the public health benefits of a sugar tax. Advisors are responsible for writing detailed briefings, submissions, and consultation documents that clearly articulate policy options, risks, and recommendations. A significant part of the role involves using mathematical and statistical models to project costs, model behavioural changes, and assess value for money. For instance, an advisor at the Department for Education might model the long-term economic return on investment for increasing early years funding, while an advisor at the Department for Energy Security and Net Zero might analyse data on household energy consumption to design a new grant scheme for insulation.

Mathematics is absolutely central to this role, transforming qualitative political objectives into quantifiable, evidence-based policy. It provides the rigour needed to

make defensible decisions that affect millions of people and involve billions of pounds of public money. Advisors use mathematical principles to cut through ambiguity, test assumptions, and provide a clear, logical foundation for policy choices. Whether it's using cost-benefit analysis for a new high-speed rail link (HS2), applying epidemiological modelling to set COVID-19 lockdown thresholds, or using statistical regression to identify the key drivers of regional economic inequality, mathematics is the indispensable tool that ensures government policy is robust, transparent, and effective.

HOW MATHEMATICS IS USED

- **Cost-Benefit Analysis (CBA) & Appraisal:** This is the cornerstone of UK public spending decisions, mandated by the HM Treasury Green Book. Advisors use CBA to quantify all the positive and negative consequences of a policy proposal in monetary terms. For example, when appraising a new tram system for a city like Manchester, an advisor would calculate the direct capital and operational costs against the benefits, which include time savings for commuters (valued using average wage data), reduced vehicle emissions (valued using the social cost of carbon), and increased business productivity. A Net Present Value (NPV) calculation is then performed to determine if the long-term benefits outweigh the initial investment.

- **Statistics & Econometrics:** Advisors rely heavily on statistical methods to analyse trends, test hypotheses, and evaluate policy impacts. They use regression analysis to isolate the effect of a specific policy from other factors. For instance, to assess the effectiveness of the National Living Wage, an advisor at the Department for Business and Trade might use multivariate regression to determine its impact on employment levels, controlling for broader economic growth and regional variations. They also analyse large-scale datasets, such as the UK Labour Force Survey or the Office for National Statistics (ONS) inflation data, to monitor economic and social conditions.

- **Operational Research & Modelling:** This involves using mathematical modelling to simulate complex systems and optimise outcomes. Advisors build models to forecast future scenarios. A key example is the modelling used by the UK Health Security Agency (UKHSA) to predict the spread of infectious diseases, which informs vaccination strategies and public health messaging. Similarly, the

Department for Transport uses traffic flow models to predict congestion impacts of new road layouts or to optimise the timing of traffic lights across a city to reduce journey times and emissions.

- **Game Theory & Behavioural Insights:** Understanding how individuals and organisations are likely to respond to policy is crucial. Game theory helps model strategic interactions, such as how energy companies might respond to a new windfall tax or how international partners might negotiate a trade deal. Furthermore, advisors at the Behavioural Insights Team (the "Nudge Unit") use principles from psychology and mathematics to design policies that encourage positive behaviours, such as increasing pension savings through auto-enrolment or boosting tax compliance by changing the wording on reminder letters.

- **Data Analysis, Statistics, and Mathematical Modelling:** The entire evidence base for modern policy is built on these disciplines. Advisors use descriptive statistics to summarise the state of the nation, inferential statistics to make predictions about populations from sample data, and sophisticated mathematical models to test policy robustness. For example, the Treasury's economic model of the UK economy is used to forecast the impact of different tax and spending decisions on GDP growth, unemployment, and public borrowing. This allows the government to stress-test its budget and understand the potential second-order effects of its fiscal policy.

KEY SKILLS & TOOLS

Skill/Tool	Application
Microsoft Excel & VBA	The workhorse for quantitative analysis across Whitehall. Used for building financial models, performing sensitivity analysis on budget forecasts, and managing large datasets from the ONS. Advisors might use Excel to model the five-year cost of a new social care policy, varying assumptions about uptake and unit cost to provide a range of possible outcomes for ministers.
Statistical Software (R & Python)	Used for advanced econometric analysis and data visualisation. An advisor at the Home Office might use R to analyse crime data, identifying hotspots and correlations with socio-economic factors to

	inform police resource allocation. Python is increasingly used for building more complex simulation models and automating data collection from various government APIs.
Stata & SPSS	Widely used in government and academia for statistical analysis of social survey data. An advisor at the Department for Work and Pensions might use Stata to analyse the Longitudinal Study of Young People in England to understand the factors that influence a person's journey from education into employment.
GIS (Geographic Information Systems)	Used to analyse and present spatial data. Crucial for policies with a regional or local dimension. An advisor at the Department for Levelling Up, Housing and Communities might use GIS software like ArcGIS to map indices of multiple deprivation against the location of new infrastructure funding, ensuring resources are targeted to the areas of greatest need.
Briefing & Submission Writing	The primary method of communicating complex mathematical findings to non-specialists. Advisors must distill sophisticated modelling results into clear, concise, and actionable prose, often using data visualisations like charts and graphs, for ministerial briefs and Cabinet committee papers.
HM Treasury Green Book	The mandatory guidance for all public sector appraisal. Advisors must be proficient in applying its methodologies for CBA, discounting future costs and benefits, and accounting for risk and uncertainty in their calculations to ensure proposals meet the Treasury's approval for funding.
Quality Assurance & Peer Review	A critical process to ensure the mathematical rigour and integrity of all analysis. All models and calculations are subject to internal peer review by other analysts within the Government Statistical Service or Government Economic Service to check for errors in methodology, data input, and logical reasoning.

Typical Pathway: The most common route is through a graduate scheme, most notably the Civil Service Fast Stream, with specialisms in the Government Economic Service (GES), Government Statistical Service (GSS), or the generalist Fast Stream. Entry typically requires a minimum 2:1 undergraduate degree, with a strong preference for degrees with a high quantitative content such as Economics, Mathematics, Physics, or Operational Research. For direct entry into senior advisor roles, a relevant Master's degree or PhD is often expected. Prior to university, strong

A-levels (or Scottish Highers) in Mathematics and Further Mathematics are highly advantageous. Career progression moves from Assistant Advisor to Advisor, Senior Advisor, and ultimately to Head of Profession or Director of Analysis. GES and GSS members are encouraged to work towards becoming a Chartered Member of the Royal Statistical Society (RSS) or a similar professional accreditation to enhance their credentials.

Industry Demand: Demand for skilled Government Advisors remains consistently high, driven by the increasing complexity of policy challenges such as climate change, an ageing population, and digital transformation. The UK government's focus on "levelling up" and data-driven decision-making further fuels the need for professionals with strong analytical and mathematical skills. While the overall size of the Civil Service fluctuates, there is a perennial need for the technical expertise provided by the GES, GSS, and the Government Operational Research Service (GORS), making these roles relatively resilient to broader public sector cuts.

Real-World Impact: Government Advisors have a profound impact on the daily lives of people across the UK. Their mathematical work underpinned the design of the furlough scheme during the pandemic, which protected millions of jobs. They have modelled the economic benefits of major projects like Crossrail and the economic impacts of Brexit. By applying mathematical rigour, they ensure that public funds are spent effectively, that policies achieve their intended outcomes, and that the government is able to navigate complex, long-term challenges for the benefit of the entire country.