

CAREERS THROUGH MATHS: ECONOMIST



JOB DESCRIPTION

An economist in the UK applies advanced mathematical and statistical methods to analyse data, build models, and forecast trends to understand how society, businesses, and governments allocate resources. Their daily responsibilities are deeply analytical, involving the collection and processing of large datasets from sources like the Office for National Statistics (ONS) or HM Revenue & Customs. They then use this data to test hypotheses, evaluate the potential impact of policy changes (such as a rise in the National Living Wage or a new carbon tax), and advise on strategic decisions. A typical project might involve building a econometric model to predict UK inflation trends for the Bank of England or conducting a cost-benefit analysis for a proposed high-speed rail (HS2) infrastructure project to determine its long-term value for money.

The work environment for economists is diverse, ranging from the fast-paced, policy-driven settings of Whitehall departments like HM Treasury and the Department for Work and Pensions, to the commercial pressure of the City of London within banks like Barclays or investment firms. Others work in specialised consultancies (e.g., Oxford Economics), international organisations, or think tanks like the National Institute of Economic and Social Research (NIESR). Much of their time is spent at a computer, utilising sophisticated software to run complex calculations and simulations, but the role also requires translating these technical findings into clear, actionable reports, briefings, and presentations for non-specialist stakeholders, including ministers, senior executives, or the public.

Mathematics is the fundamental toolkit of the economist. It provides the rigorous framework needed to move from qualitative observation to quantitative, evidence-based conclusion. Whether determining the price elasticity of demand for a product in the UK market to set optimal pricing, using calculus to maximise a social welfare function for a public policy, or applying game theory to model the competitive strategies of firms in the UK energy sector, mathematical principles are central to every analysis. This ensures that recommendations are not based on intuition alone but are grounded in logical, replicable, and defensible scientific methodology.

HOW MATHEMATICS IS USED

- **Econometrics:** This is the primary mathematical discipline, combining economic theory, statistics, and mathematics to give empirical content to economic relationships. Economists use it to quantify the impact of one variable on another. For example, a UK economist might use multiple regression analysis to determine how changes in interest rates set by the Bank of England and levels of unemployment affect UK house prices. They could also build a time-series model to forecast next quarter's GDP growth based on historical ONS data, incorporating variables like consumer confidence and business investment.
- **Calculus (Differential and Integral):** Calculus is essential for modelling change and optimisation. Economists use derivatives to find the rate of change in cost or revenue (marginal cost/revenue) to advise a UK company on the profit-maximising level of output. Integral calculus is used to calculate consumer and producer surplus, a key measure for evaluating the welfare effects of government policies, such as the introduction of a new sugar tax or the economic impact of Brexit trade deals on specific UK industries.
- **Linear Algebra:** This area of mathematics is crucial for handling and solving systems of equations that underpin complex economic models. Input-output models, used by the UK government to understand how different sectors of the economy (e.g., manufacturing, services, agriculture) are interlinked and how a shock to one might affect the others, rely heavily on matrix algebra. It is also fundamental for portfolio theory in finance, helping an asset manager in London optimise the risk-return profile of a client's investments.

- **Game Theory:** This mathematical framework analyses strategic interactions between rational decision-makers. It is used to model the behaviour of oligopolistic firms in the UK, such as the major supermarkets (Tesco, Sainsbury's, Asda) when making decisions on pricing and advertising campaigns. The UK government's competition regulator, the Competition and Markets Authority (CMA), also uses game theory to analyse potential mergers and prevent anti-competitive practices.
- **Statistical and Analytical Methods:** Beyond advanced econometrics, economists constantly employ statistical methods. They use probability distributions to assess risk and uncertainty in forecasts. Hypothesis testing is used to validate theories, such as testing whether a government skills training programme actually led to a statistically significant increase in employment rates for participants compared to a control group. Data analysis techniques are applied to large datasets (Big Data) to identify patterns in consumer behaviour or regional economic disparities across the UK.

KEY SKILLS & TOOLS

| Skill/Tool | Application |
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| Stata / EViews | These are the industry-standard econometric software packages in UK academia, government, and consultancy. Economists use them to manage large datasets, perform complex statistical analyses like panel data regression, and test the validity of their economic models. For instance, running a logistic regression to predict the probability of a UK business failing based on its financial ratios. |
| R / Python (Pandas, NumPy) | These programming languages are increasingly vital for handling very large datasets and performing custom statistical analyses that go beyond off-the-shelf software. A UK economist might use Python to scrape web data on UK property listings and then build a machine learning model to identify the key drivers of regional price variations. |
| Microsoft Excel (Advanced) | Despite more advanced tools, Excel remains a ubiquitous workhorse for quick data manipulation, preliminary analysis, and financial |

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| | modelling. Its Solver add-in is used for optimisation problems, such as minimising costs for a supply chain network across the UK. |
| SQL | Essential for querying and extracting specific data from large relational databases, which are common in organisations like banks or large retailers. An economist at a UK bank might use SQL to pull a decade's worth of transaction data for analysis. |
| Mathematical Modelling | The core skill of building abstract representations of real-world economic processes. This involves defining equations, constraints, and variables. For example, creating a mathematical model to simulate the economic impact of different immigration policy scenarios on UK public finances and GDP per capita. |
| Technical Report Writing | The ability to distil complex mathematical findings into clear, concise, and persuasive reports for a non-technical audience. This is critical when advising UK policymakers or company boards, ensuring that mathematical evidence informs the final decision. |
| Peer Review & Validation | Applying rigorous methods to check the robustness of models, including testing for statistical significance (p-values), goodness-of-fit (R-squared), and potential biases. This ensures the mathematical conclusions are sound and reliable before being acted upon. |

Typical Pathway: The standard pathway begins with strong GCSEs and A-levels, with Mathematics and Further Mathematics being highly advantageous, if not essential. The fundamental requirement is a strong undergraduate degree (a 2:1 or higher) in Economics or a closely related quantitative degree from a university recognised by the UK government's Economic Service. Many aspiring economists, particularly those targeting roles at the Bank of England or in top consultancies, pursue a specialised postgraduate degree, such as a Master's (MSc) in Economics or Econometrics. The premier entry point for government economists is the UK Government Economic Service (GES) Fast Stream, a highly competitive graduate programme. Progression can lead to senior economist roles, head of analysis, or chief economist positions. While not mandatory, becoming a Fellow of the Royal Economic Society is a mark of professional standing.

Industry Demand: Demand for economists in the UK remains robust, driven by economic uncertainty, complex policy challenges (net zero, productivity puzzle), and the increasing importance of data analytics across all sectors. The UK government is a major employer, and financial services in London consistently seek economists for forecasting and risk analysis roles. Organisations like the Office for Budget

Responsibility (OBR) and the National Infrastructure Commission also create specialised demand. Growth is particularly strong for those with skills in data science and machine learning, applied to economic problems.

Real-World Impact: Economists have a profound impact on UK society. Their analyses at the Bank of England influence interest rate decisions that affect every mortgage and savings account in the country. Their cost-benefit analyses shape multi-billion pound infrastructure decisions, from new railways to flood defences. In the private sector, their market forecasts guide investment decisions that drive economic growth and job creation. The mathematical rigour they provide is essential for designing effective policies, from the tax system to public health initiatives, ultimately aiming to improve the economic well-being of the UK population.