The Oxford Economics
Global Economic Model

April 2015
Who we are
About Oxford Economics

- Oxford Economics is a world leader in global forecasting and quantitative analysis. Our worldwide client base comprises over 850 international corporations, financial institutions, government organizations and universities.

- Founded in 1981 as a joint venture with Oxford University, Oxford Economics is now a leading independent economic consultancy. Our link to Oxford University is still present today through our management board, empirical research approach and access to Oxford scholars.

- Headquartered in Oxford, with offices around the world, we employ more than 150 people, including 90 economists, and a network of 500 contributing researchers. The rigor of our analysis, caliber of staff and links with Oxford University and other leading research groups make us a trusted resource for decision makers.
We specialise on three types of analysis

**Forecasts & Models**
Track, analyse, forecast and model country, industry and urban trends around the world

**Economic Impact**
Assess the impact of a company, industry, new technology, regulation, or market change

**Thought Leadership**
Evidence-based research to influence corporate leaders, policy-makers, and other stakeholders
We go deeper and further with our global analysis

**Further**
Event-driven scenario planning and stress testing
Tailored market sizing and sales forecasting
Impact of macro events on your markets and business

**Deeper**
Economic outlook for 201 countries
Forecasts for 100 industrial sectors
Analysis on 3,000 cities and sub-regions
Our modelling expertise sets us apart

- Oxford Economics has developed the world’s leading globally integrated economic model, relied on by over 100 leading organisations around the world.
- Our model replicates the world economy by interlinking 46 countries, 6 regional blocs and the Eurozone.
- The global economic model feeds into a series of industry, sub-regional and city models. So, you can quantify the impact of global events on a consistent basis down to your industry and local markets.
- Our team of over 90 economists set underlying global assumptions and ensure that the data, forecasts and formulas in these models are fully up-to-date.
We have one of the world’s best forecasting track records

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<tr>
<th>Forecast performance compared 2008–2012 (average absolute forecast divergence for real GDP growth)</th>
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<td>Oxford Economics</td>
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<td>Consensus Economics</td>
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Note: Forecasts made in December for year ahead

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**THE SUNDAY TIMES**

Sunday Times ranking of forecaster performance, 2013

<table>
<thead>
<tr>
<th>Forecaster</th>
<th>Score*</th>
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<tbody>
<tr>
<td>Oxford Economics</td>
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<tr>
<td>OECD</td>
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<td>IMF</td>
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<td>Capital Economics</td>
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* Top score = 10
Our model users represent a global who’s who

**Corporate**
- AT Kearney
- BG Group
- BP
- Chevron
- Deloitte
- EDF
- ENI
- Ford
- GE
- IBM
- Maersk

**Financial**
- AIG
- Alliance Bernstein
- Amex
- BNY Mellon
- Citigroup
- Fitch
- Fortress
- HSBC
- Lloyd’s
- MetLife
- Moody’s
- Nomura
- Putnam
- Standard & Poor’s
- State Street
- TD Bank
- UBS
- Visa
- Wells Fargo

**Government**
- Bank of England
- Bank of Japan
- Bank of Thailand
- Hong Kong Monetary Authority
- Office of the Comptroller of the Currency
- OPEC
- Port Authority of NY and NJ
- US Energy Information Administration
- World Bank
A pioneer in global modeling

- Oxford’s Global Economic Model was developed in the early 1980s by leading economists from Oxford Economics and Oxford University. John Walker, today’s Chairman of Oxford Economics, worked together with Sir David Hendry, Dr. John Muellbauer, and other early pioneers of econometric thinking.

- Over the past 30 years, Oxford’s global model has gone through continuous improvements. For example, after the global 2008/09 recession, we extended the model’s coverage of interest rates, balance sheet variables, credit ratings, and feedback effects.

- Over 100 organisations use our model for forecasting, stress testing and scenario analysis. It has also been used as a teaching tool at several universities.

- The model design is flexible so that it can be used in conjunction with other models. At Oxford Economics, it sits at the heart of our suite of industry, city and economic impact models.
Today’s Global Economic Model

- Oxford’s Global Economic Model is the world’s leading globally integrated macro model, used by over 100 clients around the world, including finance ministries, leading banks, and blue-chip companies.

- With a 30-year track record, the model provides a rigorous and consistent structure for forecasting, scenario analysis, stress testing and impact analysis.

- The model covers 46 countries in detail, plus the Eurozone, and provides headline forecasts for another 30 countries. Remaining countries are covered in trading blocs.

- Data and forecasts in the model are updated each month. The model is available with 5, 10 and 25-year forecast horizons.

- Oxford Economics provides telephone and e-mail support, and runs regular training workshops.
Comprehensive geographic coverage

The model covers 46 countries in detail, including many emerging markets, and provides headline forecasts for another 30 countries. The remaining countries are covered in 6 ‘blocs’: OPEC, Eastern Europe, Africa, Latin America, rest of OECD, rest of World.

### Europe
- Austria: 500+
- Belgium: 550+
- Bulgaria: 450+
- Croatia: 400+
- Czech Republic: 500+
- Denmark: 550+
- Eurozone: 300+
- Finland: 500+
- France: 600+

### Americas
- Argentina: 400+
- Brazil: 450+
- Canada: 600+
- Chile: 400+
- Mexico: 500+
- United States: 950+

### Middle East & Africa
- Saudi Arabia: 400+
- South Africa: 400+
- UAE: 400+

### Asia
- Australia: 550+
- China: 650+
- Hong Kong: 450+
- India: 450+
- Indonesia: 400+
- Japan: 700+
- Malaysia: 400+
- Philippines: 400+
- Singapore: 400+
- South Korea: 550+
- Taiwan: 550+
- Thailand: 400+
Integrated global model with multiple linkages

- **Trade volumes**
  - World trade for each country is a weighted average of the growth in total goods imports (excluding oil) of all other countries.

- **Competitiveness**
  - IMF relative unit labour costs where available.

- **Trade prices**
  - One country’s exports is another’s imports

- **Interest rates and exchange rates**

- **Commodity prices**
  - Oil depends on supply/demand balance
  - Metals on industrial growth

- **Capital flows**
  - Including the impact of FDI, credit ratings and bond spreads.
User-friendly interface

Oxford Economics’ models come with user-friendly, Windows-based software. This software makes it very easy to:

- Change economic assumptions to produce new forecasts or scenarios.
- Add new variables and equations.
- Produce presentation-quality graphics.
- Download data into spreadsheets and other data-handling packages.
- Compare, map and graph data across countries and alternative scenarios.
- Build your own economic models.
- Access Oxford Economics’ scenarios with one click.
Ongoing model support

To help you get the most value out of models and adapt them to your decision making activities, Oxford Economics provides ongoing user support, including:

- Initial orientation and training sessions in person or via video conferencing.
- Regular webinars on model use and our global macro outlook.
- Ongoing support from Oxford’s economists and IT staff by telephone and email.
- On-line training tools, including user manual and videos.
Key advantages of Oxford Global Economic Model

- The world’s most commonly used globally integrated economic model
- Comprehensive country coverage, including full range of emerging markets
- Open architecture that shows the linkages between country models and equations
- Proven forecasting track record, with over 30 years of experience
- Monthly data and forecast updates verified by Oxford’s large team of economists
- Regular scenario analysis
- Powerful, user-friendly software
- Flexibility to change data and equations
- Extensive training and support
- On-going model research and development programme
- Large client base of over 100 leading institutions
How our model works
Our modelling formula

There are three main types of economic models:

1. **Vector Auto Regression (VAR):** Purely statistical models that capture the linear interdependencies among multiple time series. Because they lack an economic framework, these models are best used for short-term (less than 6 months) forecasting, rather than longer-term analysis.

2. **Dynamic-Stochastic General Equilibrium (DSGE):** Designed in line with macroeconomic theory, these models replicate the behaviour of the economy by analyzing the interaction of economic variables. Since they are equilibrium models that reproduce historical averages, they perform poorly in forecasting tests.

3. **Macroeconometric Error Correction:** A hybrid modelling method that combines the merits of VAR and DSGE models by estimating the speed at which a dependent variable returns to its equilibrium after a shock.

Oxford Economics use this third approach, which is best equipped to support our sophisticated forecasting and analytical activities. Our economic model consists of over 26,500 interlinked equations based on historical correlations and economic theory.
Economic drivers behind the model

- The Oxford model is an eclectic model designed to capture the key relationships in the global economy.
  - Keynesian in the short run
  - Monetarist in the long run

- In the short run, shocks to demand will generate economic cycles that can be influenced by fiscal and monetary policy.

- But over the long-run, output is determined by supply side factors: investment, demographics, labour participation and productivity.
The basic principle behind the Oxford model is that economic trends and policies work in combination to drive the growth of an economy. This can be expressed as a formula:

\[
Y = C + I + G + NX
\]

where:
- \( Y \) is GDP
- \( C \) is Consumption (function of income, wealth, prices and interest rates)
- \( I \) is Investment (function of return on capital and changes in capacity utilization)
- \( G \) is Government spending (function of policy choices and state of the economy)
- \( NX \) is Net exports = exports – imports (function of global economic conditions)

Our economists input initial assumptions into our model equations. The model then runs through thousands of iterations to solve across all country models to arrive at an equilibrium level.
How our country models work

The broad structure of our models is similar across countries, with amendments to reflect country specific factors such as dependence on commodities, exchange rate regime, and flexibility of the labour market. The key relationships in a typical model include:

- **Consumer spending** is driven by real income, wealth and interest rates.
- **Investment** is driven by the return on investment and changes in capacity utilization.
- **Exports** depend on world demand and competitiveness.
- **Wages** move with inflation, productivity and unemployment relative to the natural rate.
- **Prices** are a mark-up on unit costs, are profit margins are a function of the output gap.
- **Monetary policy** is modelled to reflect central bank behaviour.
- **Exchange rates** are determined by relative productivity and net external assets in the long run, and by movements in relative interest rates in the short run.
Example: A China hard landing

If you have a China hard landing then this translates into the global economy in a number of ways:

- Lower Chinese demand mean fewer jobs. This subdues wages, and improves manufacturer competitiveness. If Chinese authorities respond to weaker growth by managing the exchange rate lower, that also increases competitiveness in world markets. These factors add to the pressure on exporters in the rest of the world.

- There will be downward pressure on Chinese inflation, resulting in lower Chinese export prices. Other countries’ import prices will therefore be lower, cutting their import bill but also putting downward pressure on their inflation.

- Lower Chinese growth means less demand for oil and other commodities. That puts downward pressure on commodity prices, exacerbating the impact of the China slowdown for net commodity exporters but mitigating the impact to some degree for countries that are net commodity importers.

- Weaker demand causes Chinese imports to fall. This translates into lower exports. Countries whose exports are most dependent on China suffer most, which in turn hits their economic growth so that they import less from China (and other countries), creating adverse global multiplier effects.
What our global model can do
Our global model supports a wide range of business analysis

Our model can provide a rigorous, customisable framework to support a wide range of planning, marketing and risk management activities.

**Scenario planning**
Assess the impact of potential economic, political or financial shocks on your revenue, costs and market exposure

**Market sizing**
Help identify key markets around the world and size the opportunity for your products and services

**Forecasting**
Enable you to correlate economic drivers to your business so that you can forecast sales performance

**Stress testing**
Conduct stress testing and reverse stress testing. Financial firms can use the model to run CCAR scenarios to stress test balance sheets

**Impact analysis**
Gauge how a change to a government policy or emerging macro development will affect your business

**Data codification**
Provide a rich databank of consistent economic indicators to support various planning and budgeting activities

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**GLOBAL ECONOMIC MODEL**

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Oxford Economics
The model can be used to address a broad set of questions

- What is the economic impact of escalating tensions between Russia and Ukraine?
- What would be the impact of a banking crisis in China?
- What would be the repercussions of a Eurozone break-up?
- Will tapering in the US trigger an emerging market capital crisis?
- How damaging are high oil prices for the global economy?
- Can a renaissance in the US lift the global economy?
- What would be the impact of deflation on the Eurozone economy?
Our model supplies you with key scenarios

The Oxford Global Economic Model allows you to assess the impact of key scenarios at a click-of-the-button.

Scenarios are regular updated but currently cover the following risk factors:

- Commodity markets – oil price and supply shocks
- Exchange rate risk
- Quantitative easing and interest rate moves by leading Central Banks
- Credit crunch
- Fiscal austerity

Results table is automatically displayed after the scenario. Our standard quarterly scenarios can also be accessed through our Data Workstation.
Our Global Model comes with a Data Workstation

Our Data Workstation offers a user-friendly platform that allows you to easily select and compare data and forecasts across countries, regions, and time periods, along with a range of analytical functions, including:

- **Search** – including saved searches that refresh automatically.

- **Mapping** – enables you to create a visual display of data and trends across countries.

- **Multiple databanks** – ability to compare data across multiple databases to assess the impact of alternative scenarios.

- **Download** – allows you to download tables, graphs and maps in a variety of formats for insertion into presentations.

- **Excel plug-in** – so that you can easily sort and export data to pre-formatted Excel sheets.
Continuous improvement

Despite the good performance of the Oxford Global Economic Model, the model undergoes continuous improvement to align it to today’s complex and dynamic global marketplace. Recent examples include:

- **Expanding the range of interest rates and balance sheet indicators** to better reflect how changes in credit conditions impact the economy – vital to analysing both the Eurozone crisis and the impact of central bank quantitative easing programs.

- **Breaking down GDP into 12 high-level sectors**, so clients can quantify the impact of a scenario on the manufacturing compared with, say, construction or financial services.

- **Forecasting changes to sovereign credit ratings**, to show how these would shift under alternative economic scenarios and their implications for bond yields.

- **Introduction of other risk indicators**, showing how trade credit, regulatory and political risk are also likely to shift under changing economic conditions.

- **Detailed modelling of trade in liquefied natural gas (LNG)** – to quantify how different scenarios for the shale revolution will impact on global energy markets.

- **Expansion off indicators to meet client requirements**, including additional variables for CCAR stress testing and breakdown of Canada by province.