





Oxford Economics: Macro-modelling - capturing contagion & downside risks

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Introduction

- How should macro models be used to help stress testers?
- How can the model capture tail risk and contagion?
- Current risks our Global Scenario Service shows risks still skewed to the downside
- A detailed look at the impact of a slowdown in China what are the channels that the shock will operate through

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.



Increased focus on stress testing around the world...

- Stress testing has become a critical component of the risk identification and risk management processes of financial institutions and has "a leading role to play in strengthening bank corporate governance and the resilience of individual banks and the financial system".
- National supervisors have placed increasing emphasis on improved stress-testing procedures, such as the Comprehensive Capital Analysis and Review (CCAR) in the US, the Asset Quality Review (AQR) and subsequent EBA exercise in Europe, and the Bank of England in the UK.
- Using our models, Oxford Economics can run scenarios for domestic banks or for international banks that may need to comply with several different jurisdictions.
- We go deeper than other firms, providing stress testing and scenarios on a sub-national basis, as well as for countries and international regions.



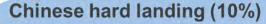
...a focus that will only increase

- New Bank of England stress testing framework will focus more on potential individual weaknesses in institutions through the 'biennial exploratory scenario' this will probe risks from lending to particular sectors or exposure to regional issues.
- This complements a more traditional 'annual cyclical scenario' which will be flexed to be more severe in the good times.
- Our clients prompted by regulators worldwide are asking more questions about our models.
- Using models for stress testing is important the recent report into the failure of HBOS drew attention to the lack of models underpinning its overly optimistic view of how its corporate loan book would perform under stressed conditions.
- When IFRS9 is introduced in 2018, institutions will have to book current losses based on a view of life time expected loss across a range of scenarios. With Risk and Finance Directors expected to sign off on the P&L, the provenance of these forecasts will be closely questioned.

Key linkages in the Oxford model

Key linkages

- Commodities channel
- Trade channel
- Policy channel
- Asset price channel
- Other channels risk and confidence



Amid mounting evidence of Chinese slowdown, we examine the implications of further shocks to growth

Residential investment is dragged lower; other private investment plans are scaled back

The shock to growth spills over to emerging economies, asset prices adjust markedly, and commodity prices take a significant hit

EM middle-income trap (5%)

We explore the possibility that emerging market convergence towards the higherincome levels of advanced economy countries falters

As prospects for future emerging market growth are reassessed, capital flows out of emerging markets and weakness in activity persists

Global growth stalls, as EM weakness spills over to advanced economies

Fed tightens (10%)

Markets have appeared to anticipate a much lower path for future US monetary policy than projected by FOMC members themselves

We explore the possibility that the Fed is proved right – and markets adjust accordingly

Amid the market turmoil, emerging markets bear the brunt of the adjustment

Secular stagnation (5%)

Weakness in demand weighs on advanced economy growth

With the zero lower bound biting, central banks are left floundering

The persistent weakness in demand feeds into weaker potential supply, exacerbating advanced economy problems

But emerging economies are not immune

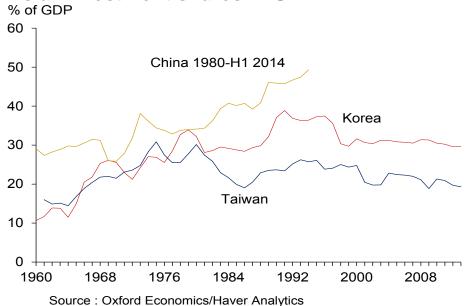
Domestic demand fragility



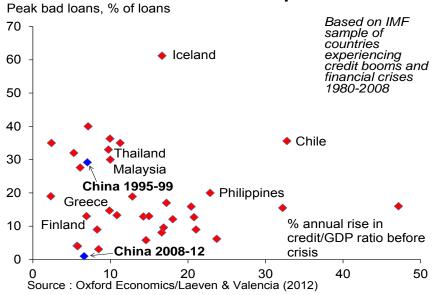
Which risks should we incorporate?

 Monitoring the key imbalances in the global economy is a good start. And expert judgement will be key.

Asia: Investment shares in GDP



World: Bad loans and credit expansion



Risks abound as Fed lift-off nears

- Oxford Economics Global Scenario Service report outlines key risks to our central forecast for the global economy
- Key themes:
 - Risks remain very much to the downside
 - Their impact would vary hugely across countries
 - Regions are not completely immune from shocks elsewhere
 - Different scenarios imply very different behaviour from the Fed
 - But conventional monetary policy is generally highly constrained

Our latest scenarios

Cyclical:

- China hard landing a significant hit to investment
- **Fed tightens** a severe market reaction
- Global growth surges an oil production surprise

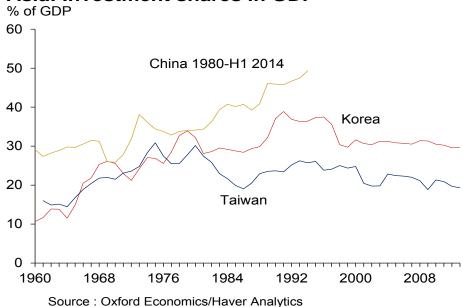
Structural:

- Secular stagnation the zero lower bound bites
- EM middle-income trap the convergence process falters

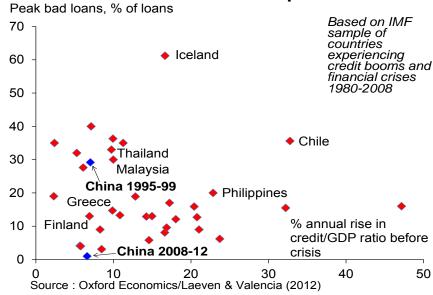
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Asia: Investment shares in GDP

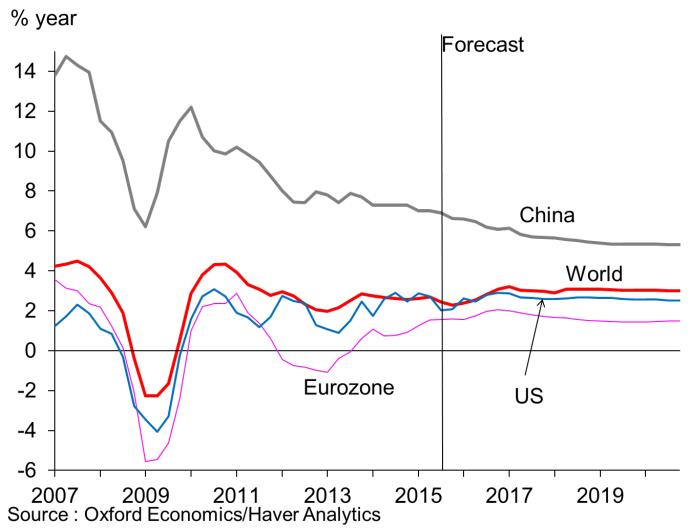


World: Bad loans and credit expansion



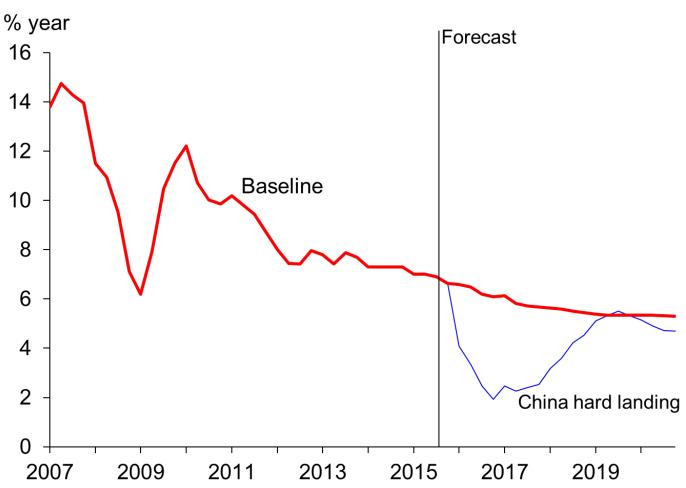
China slows gradually in the baseline...

World: GDP (at purchasing power parity)



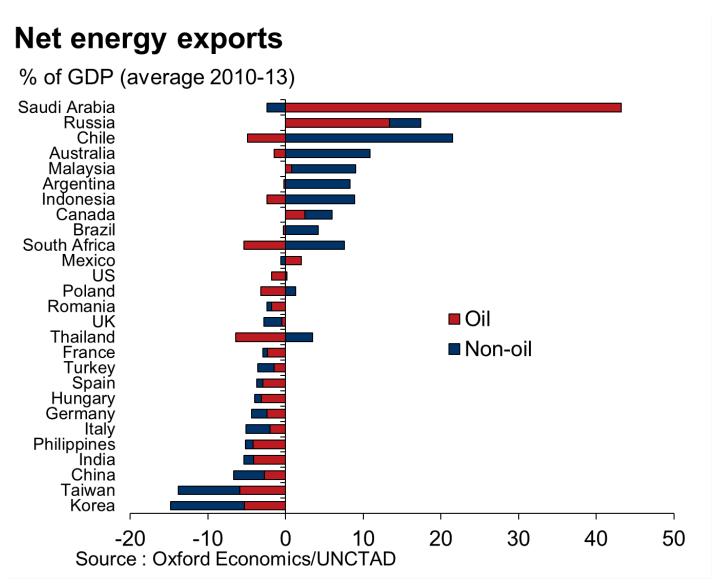
...unlike in the hard landing scenario



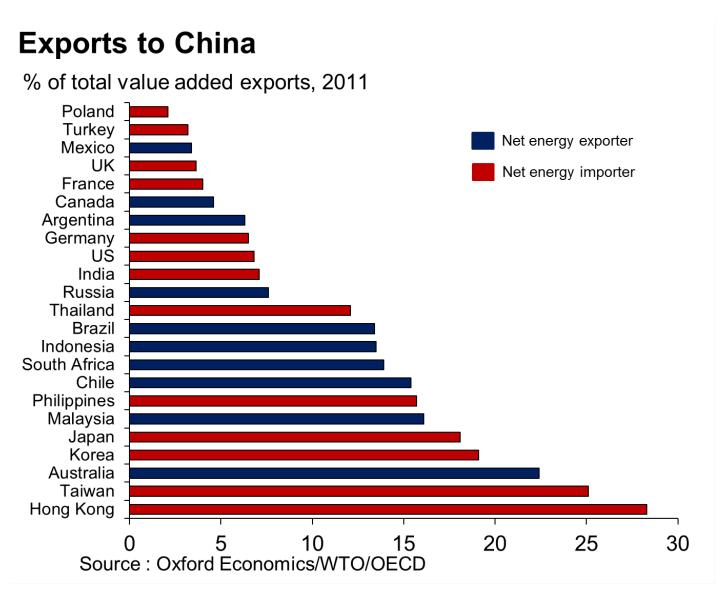


Source: Oxford Economics/Haver Analytics

China's global links run deep...



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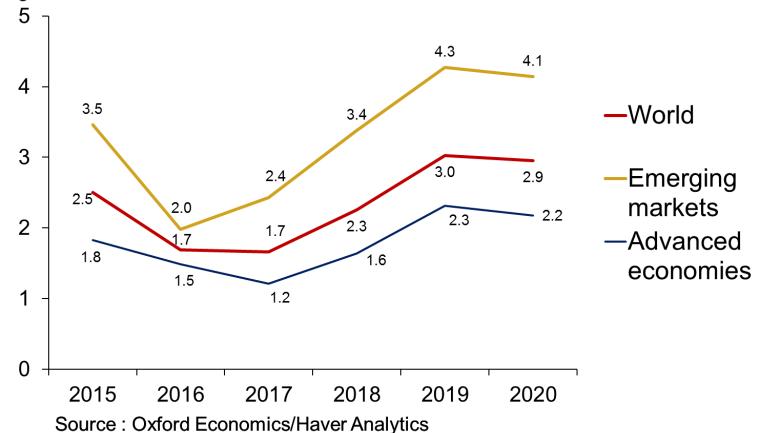
Key linkages

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- Other channels

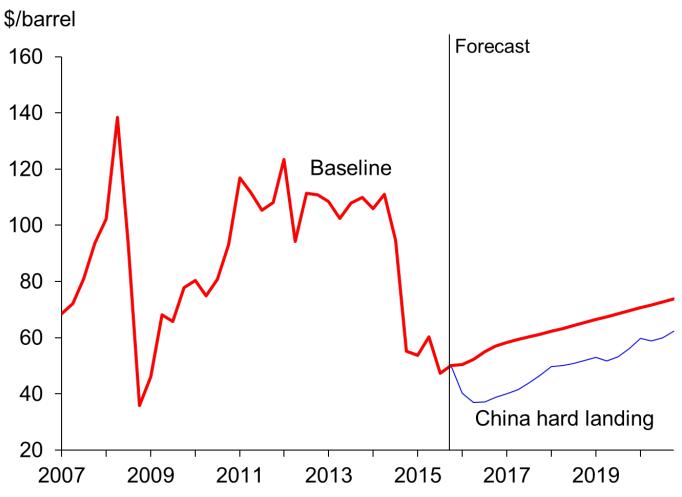
GDP: Impact of China hard landing % difference in level of GDP versus baseline 0.0 0 0.0 -0.7 -World -1 -1.8 -1.8 -1.8 -2 -2.0 **Emerging** -2.2 -2.3 markets -3 -3.7 -3.1 -3.1 —Advanced -3.1 -4 economies -4.8 -5.0 -5 -5.3 -6 2015 2016 2017 2018 2020 2019 Source: Oxford Economics/Haver Analytics

GDP: Impact of China hard landing

% growth in scenario



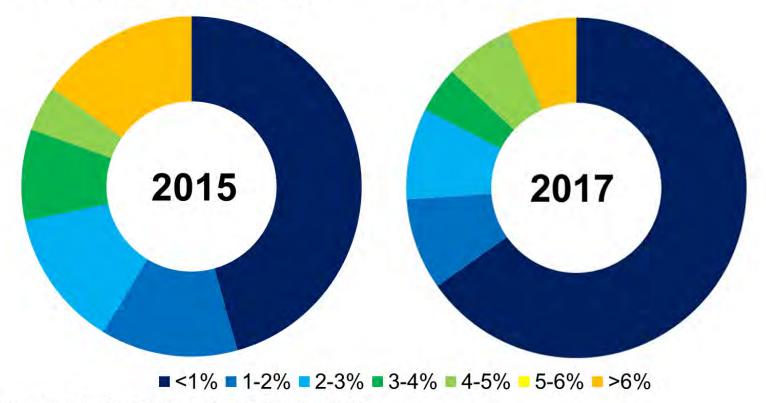
World oil price



Source: Oxford Economics/Haver Analytics

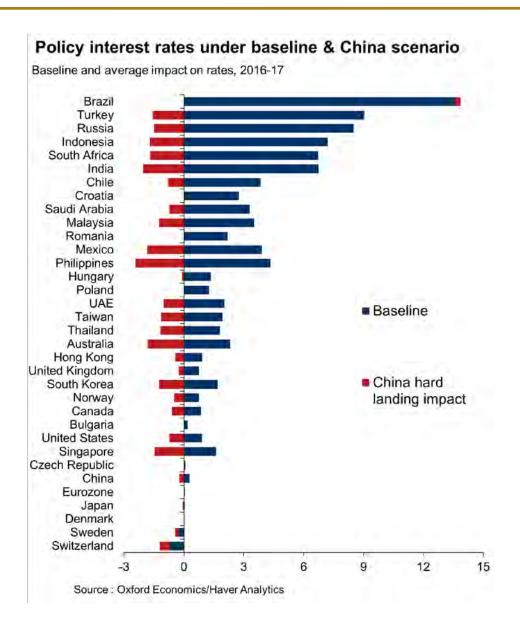
Central bank policy rates in China hard landing

% of countries at specified policy rates in 2015 and 2017



Source: Oxford Economics/Haver Analytics

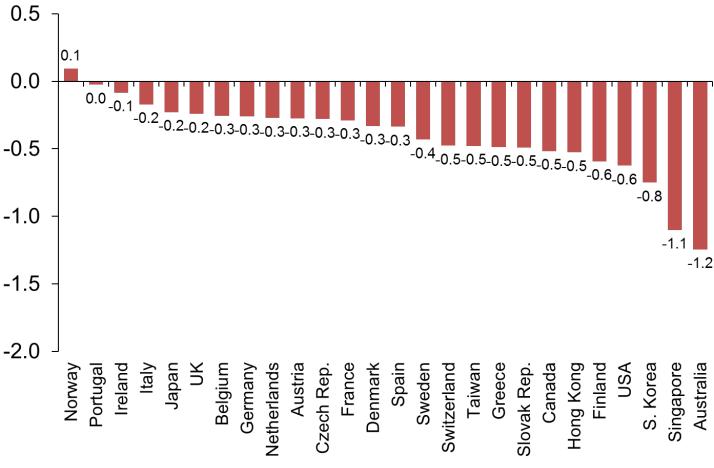
Cross-country impact: policy rates



Cross-country impact: long-term bond yields

Long-term yields: Impact on advanced economies

Percentage point difference versus baseline, 2016-17



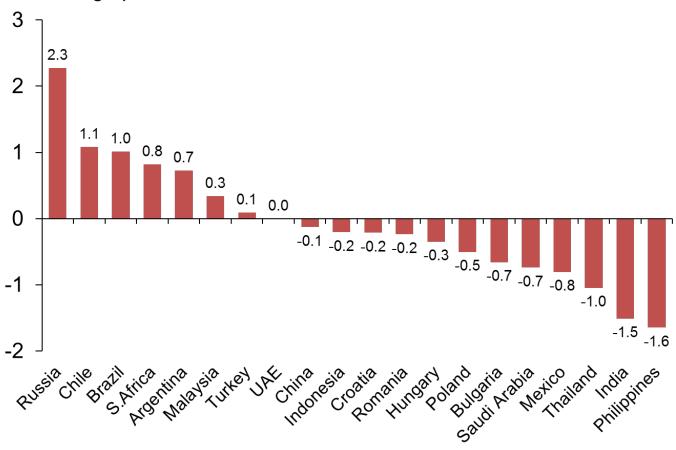
Source: Oxford Economics



Cross-country impact: long-term bond yields

Long-term yields: Impact on emerging markets

Percentage point difference versus baseline, 2016-17

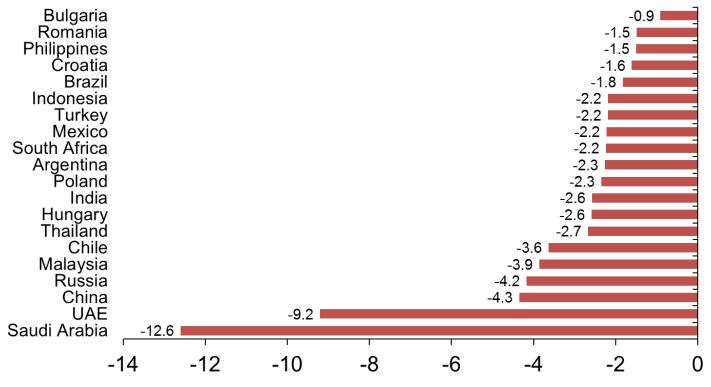


Source: Oxford Economics

Cross-country impact: nominal GDP

Nominal GDP: Impact on emerging markets

% difference in level of GDP versus baseline, 2016-17

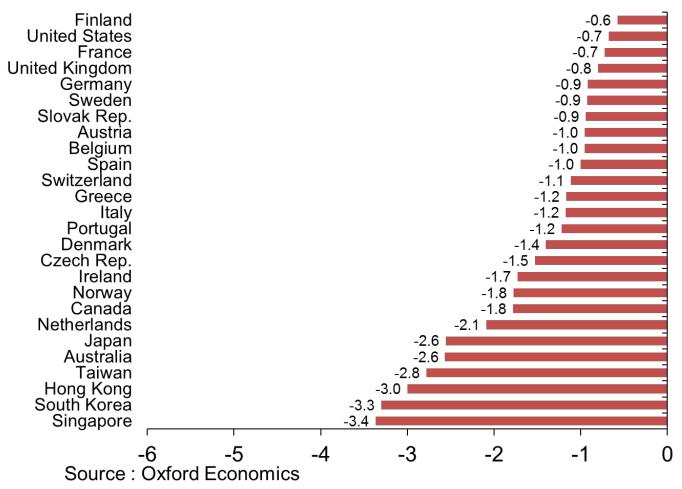


Source: Oxford Economics

Cross-country impact: real GDP

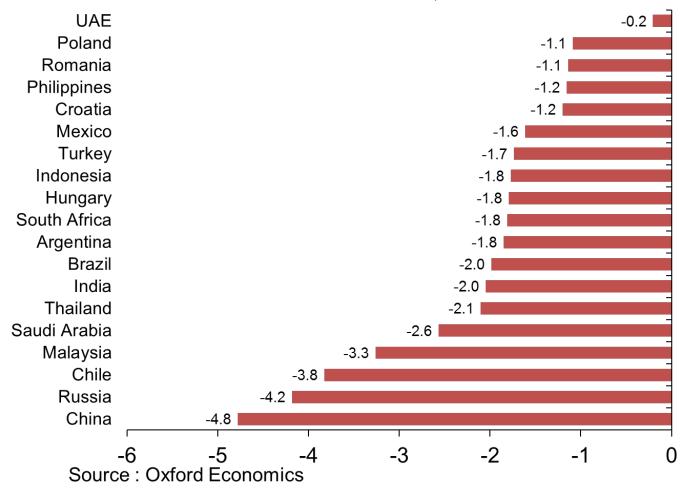
GDP impact, advanced economies

% difference in level of GDP versus baseline, 2016-17



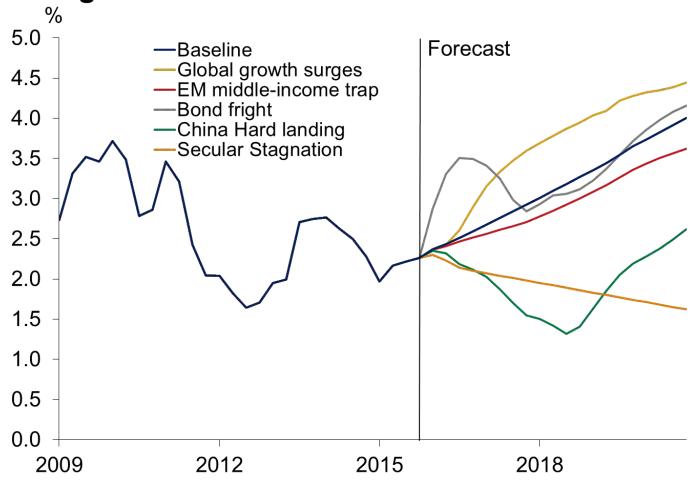
GDP impact, emerging economies

% difference in level of GDP versus baseline, 2016-17



Significant implications for markets in different scenarios

Long term interest rates: United States



Source: Oxford Economics/Haver Analytics

Final thoughts

- Traditional macroeconomic models are a useful tool for stress testers because they
 do a good job of capturing the traditional channels through which economies interact
- In the past a common criticism was that models weren't calibrated over times of stress that where severe enough to describe tail events. That is harder to argue today
- The last recession provides a useful set of shocks that can be used to calibrate downside scenarios – this includes elusive confidence shocks where were can now be calibrated from historic experience and benchmarked against volatility measures such as the VIX
- But financial contagion will always be hard to capture