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MODELLING NET INTEREST INCOME IN A LOW RATE ENVIRONMENT

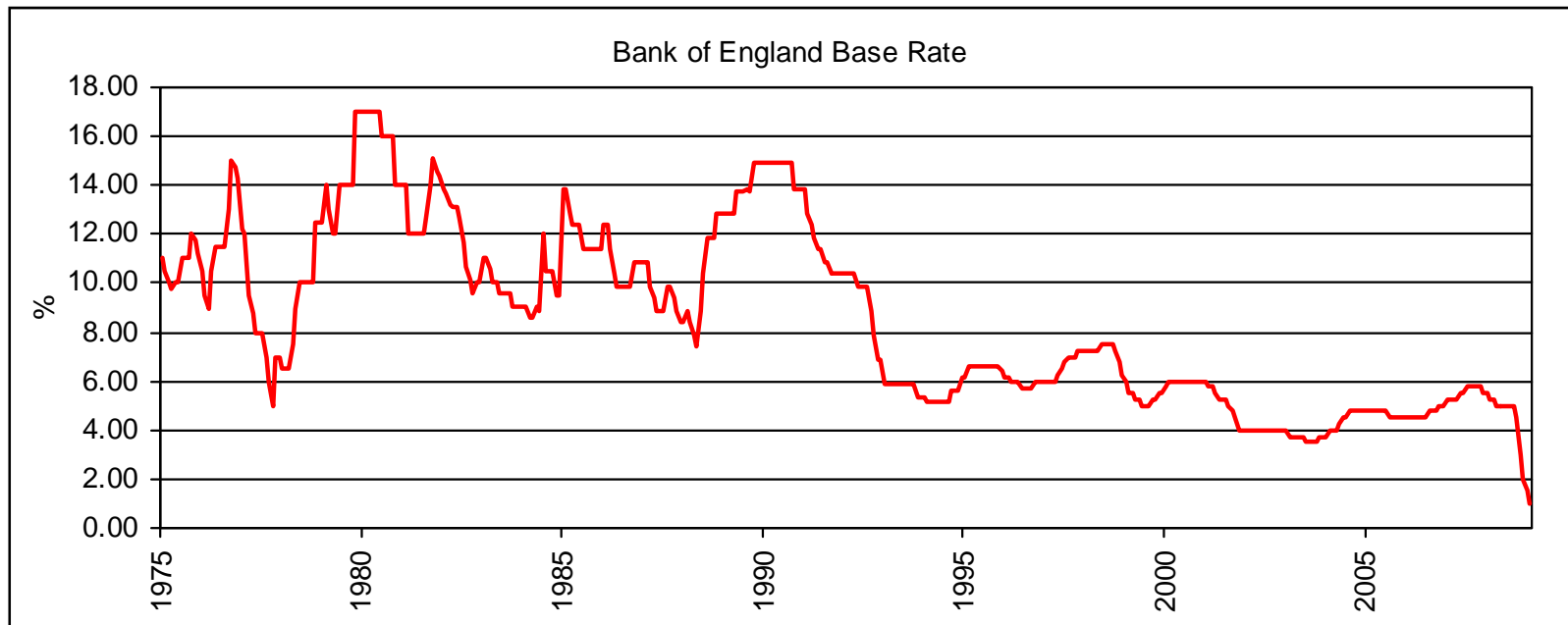
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February 2009

Modelling Net Interest Income in a Low Rate Environment

- Interest Rate Environment
- Measurement of Interest Rate Risk
- Key Assumptions Employed

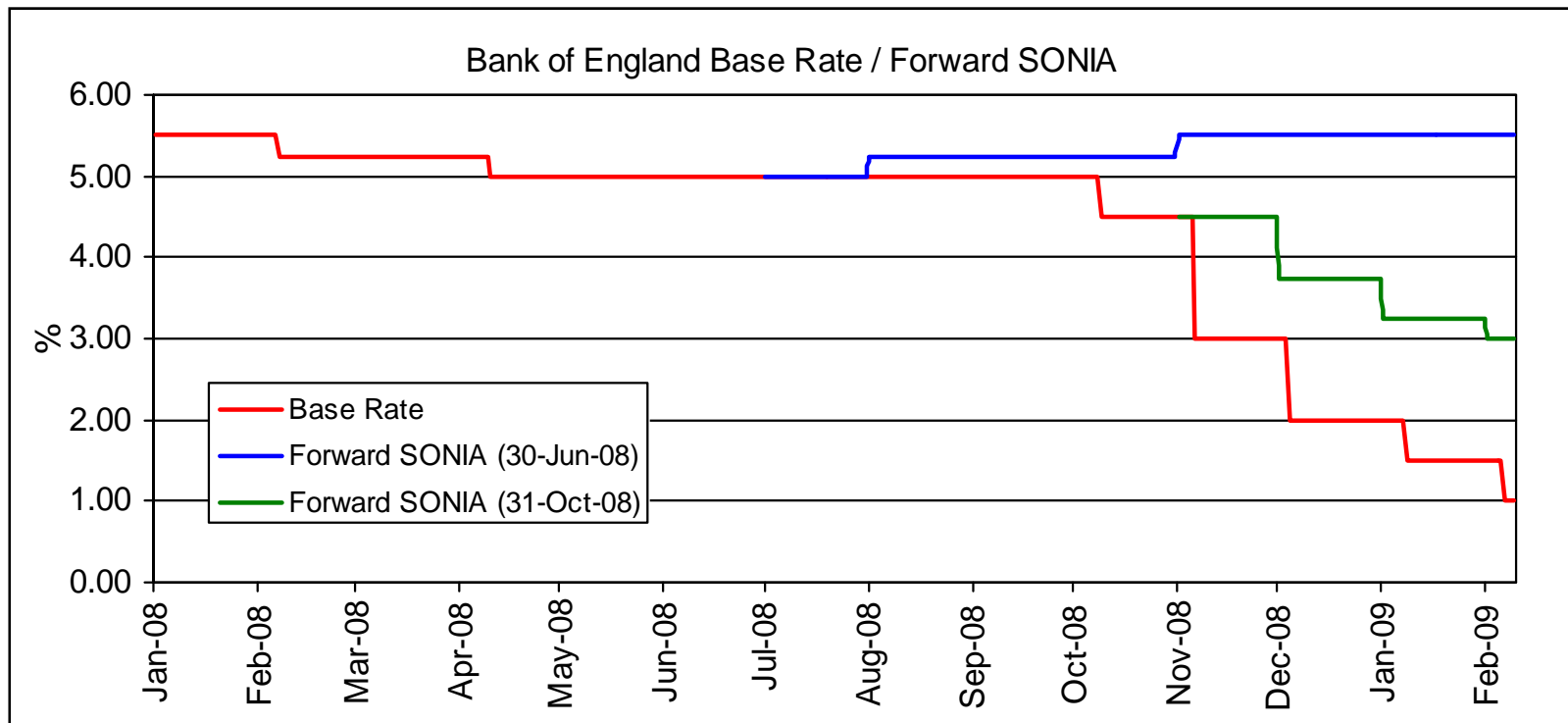
Interest Rate Environment – Bank of England Base Rate

- Bank of England Base Rate is now at its lowest level in 300 years.
- UK Base Rate moved within a range of 3.50% to 7.50% during the 16 years to October 2008



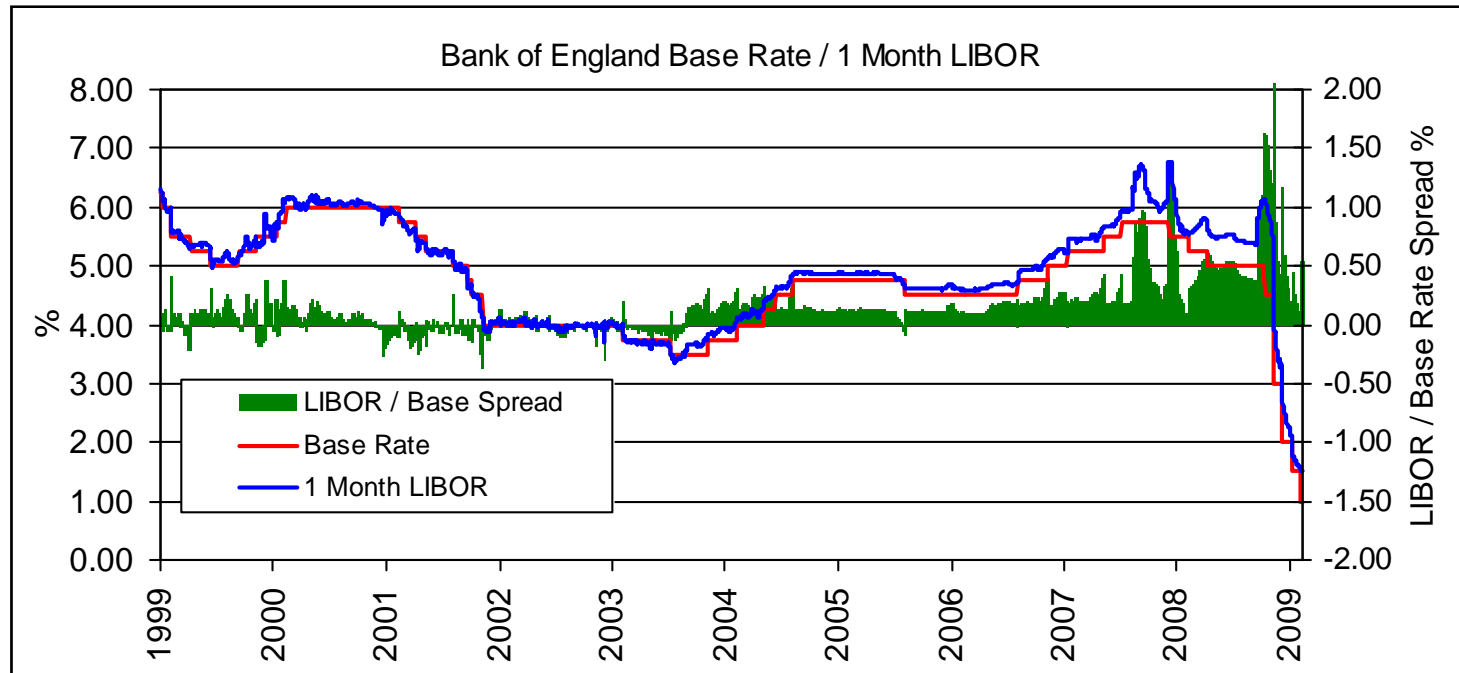
Interest Rate Environment – Market Expectations

- Forward SONIA rates did not anticipate the low rate environment



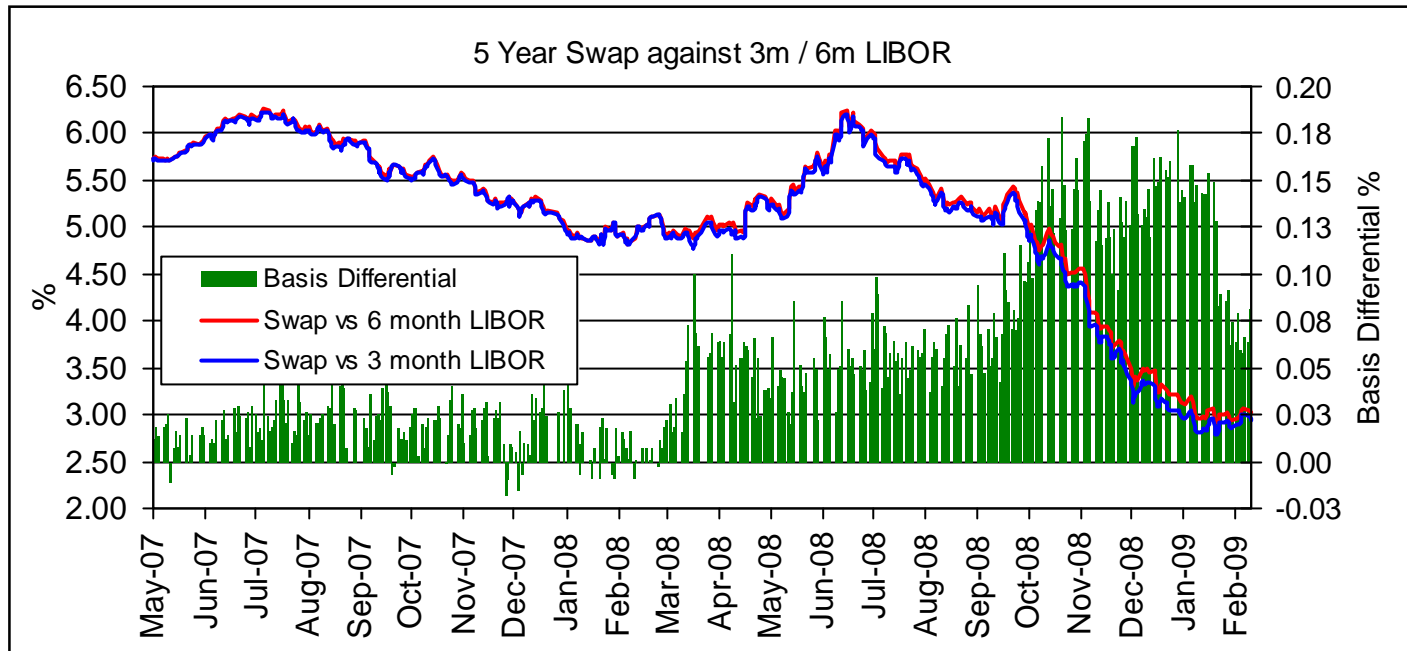
Interest Rate Environment – Basis Risk: Base Rate / LIBOR

- The relationship between base rate and LIBOR has changed



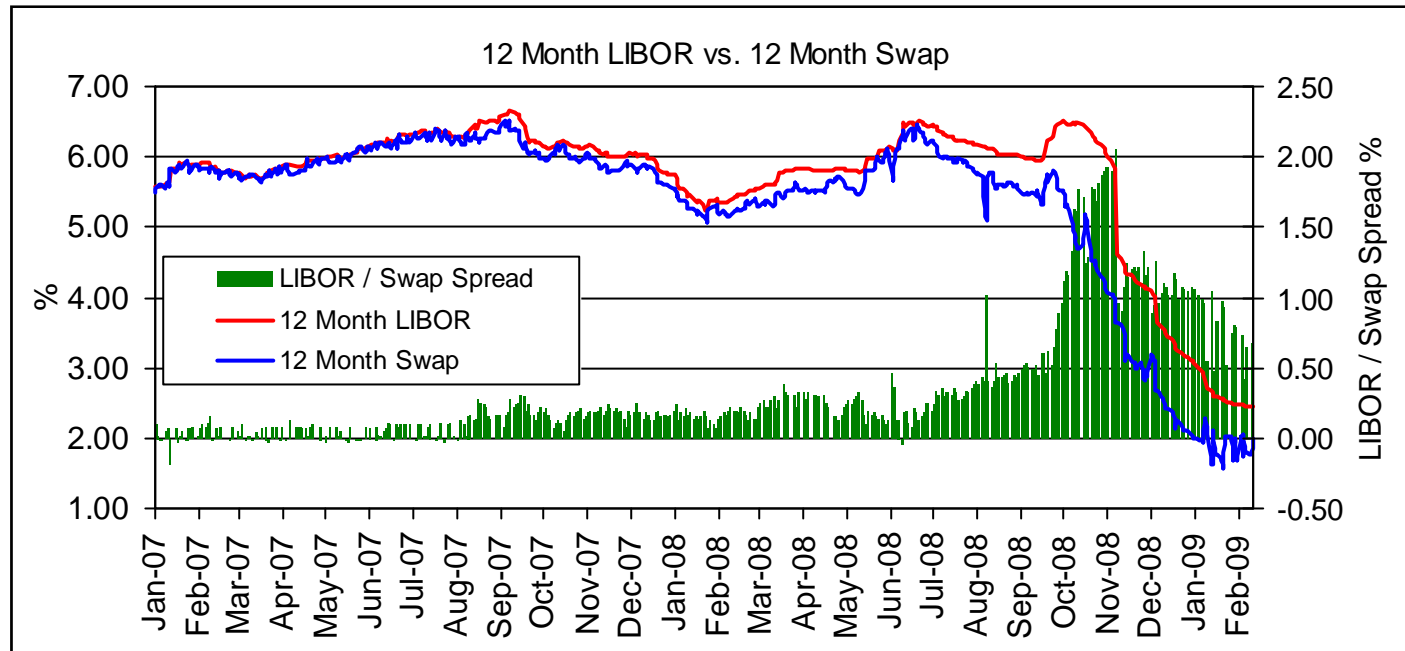
Interest Rates – Basis Risk: Swap Basis

- The relationship between swap rates with different LIBOR resets has changed



Interest Rates – Basis Risk: Swaps vs. LIBOR

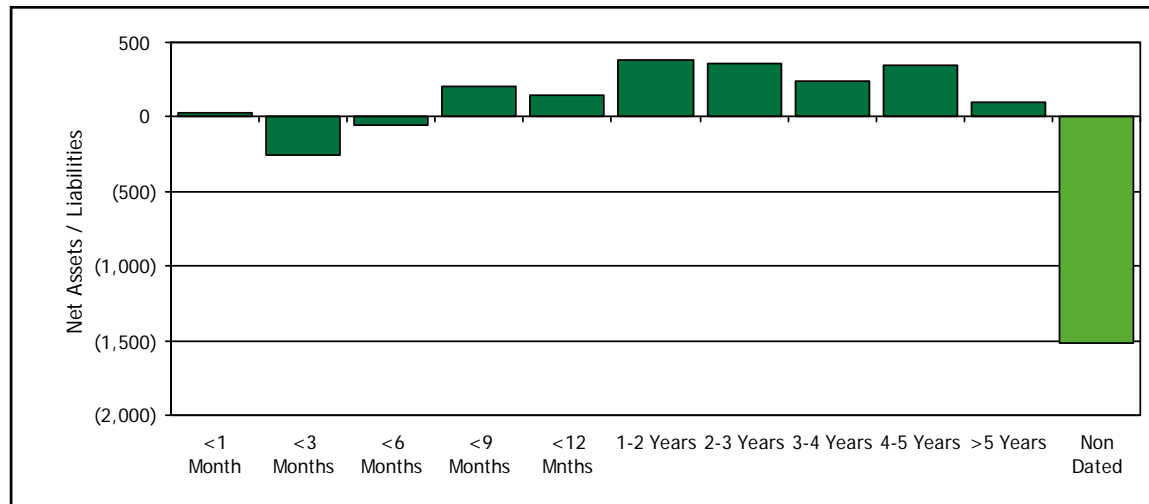
- The relationship between swap rates and LIBOR has changed



Measurement of Interest Rate Risk

Gap Analysis - a start point

- All assets and liabilities analysed in terms of their next expected re-price date



- Simple method of measuring structural interest rate position.
- However, does not measure:
 - margin risk
 - basis risk
 - other non-linear impacts e.g. prepayment risk

Measurement of Interest Rate Risk

Simulation Analysis

- NII projections under a wide range of interest rate scenarios. (Rate shock, discrete scenarios, Monte Carlo)
- Basis risk is measured by incorporating assumptions about the relationship between base rate and LIBOR.
- Margin risk is measured by incorporating dynamic pricing assumptions.
- Prepayment risk is measured through incorporating dynamic prepayment assumptions.

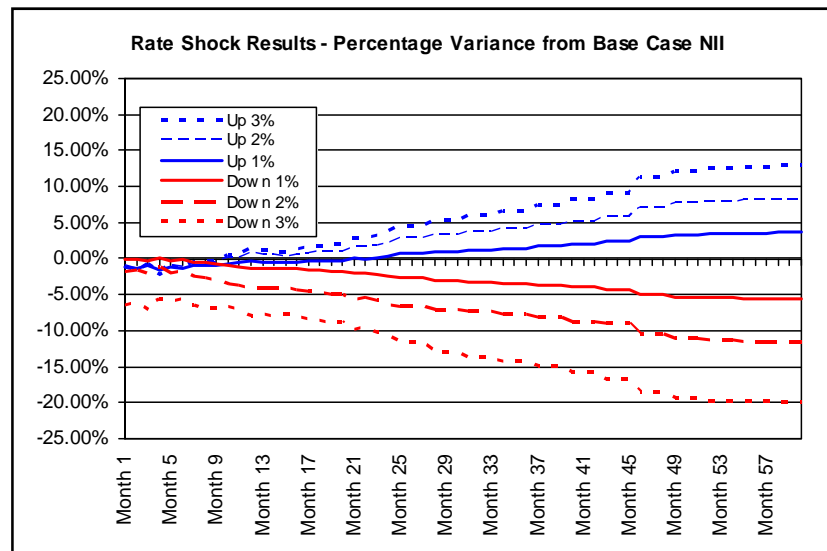
However ...

- Assumptions can be difficult to obtain and back test, particularly as applied to a low rate environment.
- Model can become a “black box” if overly complex.
- Focus can become short term.

Measurement of Interest Rate Risk

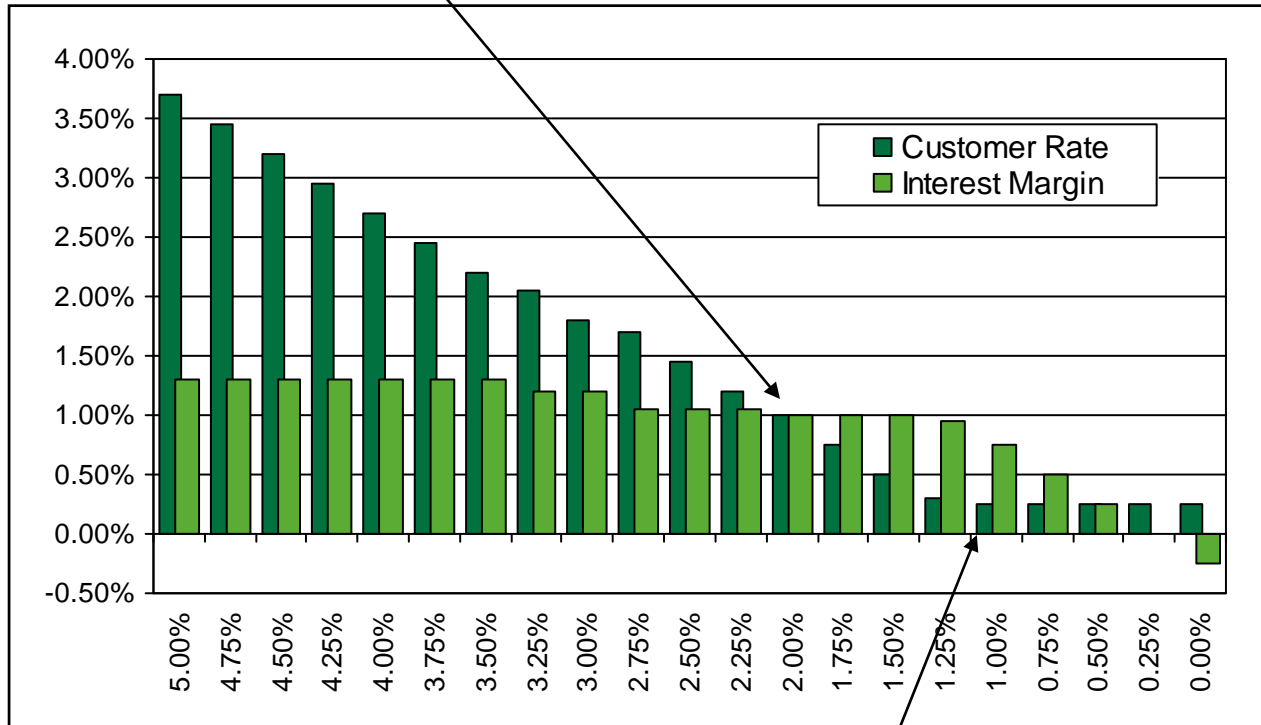
Simulation Analysis Results

- Scenario analysis can be used to analyse the impact of specific interest rate scenarios; e.g. LIBOR / base rate spread widening, different yield curve shapes, etc. It can also be used to assess the impact of key assumptions.
- Rate Shock analysis is used to show NII sensitivity to a parallel shift in rates across the curve (see chart below).
- Monte Carlo Analysis generates NII results for a high number of scenarios. This can be for calculating an Earnings at Risk number, or for establishing the key NII drivers.



Key Assumptions – Deposit Product Margin Compression

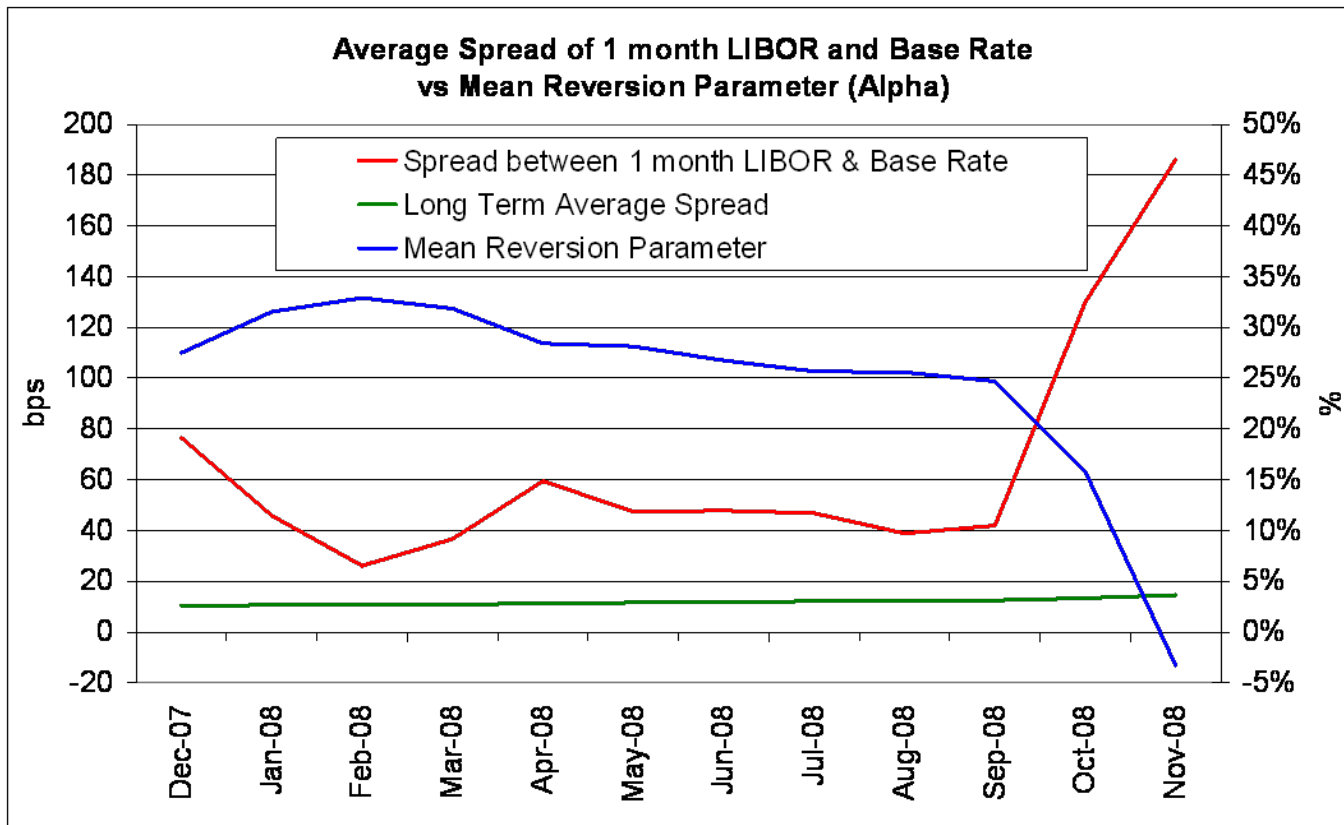
Pricing risk – Margin compressed as base rate falls



Implied Floor – The lowest rate that the bank is prepared to pay - e.g. 0.25%

Key Assumptions – Base Rate / LIBOR Relationship

- Models can begin to break down in extreme rate environments.
- E.g. the increase in the spread between 1 Month LIBOR and base rate has caused our mean reversion parameter to switch to negative.



Key Assumptions – Prepayments

Dynamic multi-factor prepayment models include factors such as:

- Loan rate vs. current market rate
- House Price Inflation
- Seasonality
- Age of loan (“burnout”)
- Prepayment Charging Structure
- etc.

How accurate are these assumptions in a low rate environment?

In Summary

- We are in an extreme interest rate environment.
- Long held relationships between different interest rates have changed significantly, causing some models to “break down”.
- Key assumptions are difficult to obtain for extreme events due to scarcity of relevant historic data.

Key lessons learned:

- Be flexible - don't just blindly follow the model results
 - Challenge the assumptions
 - Review the hedge strategy
 - Review the risk measures employed
- Always expect the unexpected!