Rates Strategy

A Research Publication by DZ BANK AG

Rate forecasting methodology

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DZ BANK Fixed Income Research forecasts the generic benchmark yield curve for Germany (bund curve) and the US (UST curve). In addition, based on these yield curves the corresponding US and EUR swap curves are forecast via the estimated swap spreads. The term “generic yields” means that yields are forecast for a specific maturity in years and **not** for a specific **financial instrument**. Grid points of the curve (key interest rate as well as generic two and ten-year maturities) are forecast first of all. Additional maturities (money market rates for maturities of under 12 months and generic yields of one through to ten-year as well as 30-year maturities) are interpolated by applying statistical concepts and finally adjusted by means of an expert opinion, through which the current market factors are mapped. The benchmark yield curves constitute the basis for the analysis work in the other categories of DZ BANK Fixed Income Research.

In terms of time periods, the generic yield curves are forecast monthly for three, six and twelve months’ time as well as for the following year-end. Furthermore, at lengthier intervals DZ BANK Fixed Income Research produces a long-term interest rate forecast over a five-year period with individual six-month time frames.

For its interest rate forecasts, DZ BANK Fixed Income Research examines fundamental factors such as growth and inflation as well as the monetary policy of the central banks. Market factors such as expectations, positioning and sentiment also play an important role. DZ BANK Fixed Income Research uses external data from various suppliers, in-house forecasts and consensus forecasts as well as economic information in order firstly to refine the expert opinion and secondly to ensure that the forecasting work and methodology remain at the cutting edge of scientific knowledge.

The process of producing DZ BANK interest rate forecasts comprises five stages, at the end of which the generic yield curves for Germany (bund curve) and the US (UST curve) as well as the corresponding US and EUR swap curves are obtained. These steps are: i) key rate forecast, ii) model estimate, iii) mapping of expert knowledge, iv) production of generic yield curves and v) the estimation of swap spreads and production of swap curves.

OVERVIEW

DZ BANK Fixed Income Research forecasts the generic benchmark yield curve for Germany (bund curve) and the US (UST curve). In addition, based on these yield curves the corresponding US and EUR swap curves are forecast via the estimated swap spreads. The term “generic yields” means that yields are forecast for a specific maturity in years and not for a specific financial instrument. Grid points of the curve (key interest rate as well as generic two and ten-year maturities) are forecast first of all. Additional maturities (money market rates for maturities of under 12 months, generic yields of one through to ten-year as well as 30-year maturities) are interpolated by applying statistical concepts and finally adjusted by means of an expert opinion, through which the current market factors are mapped. The benchmark yield curves constitute the basis for the analysis work in the other categories of DZ BANK Fixed Income Research.

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THEORETICAL BASIS

Theoretical economic concepts on activity, growth and inflation
Economic theory addresses fundamental processes and interrelationships in economic activity within a macroeconomic context. The aim is to identify how well and how precisely these processes work, and how they influence growth and inflation. These in turn are fundamental factors for the behaviour of central banks and the development of capital market yields.

Monetary theory
Monetary theory, as an element of macroeconomics, deals with how money is created, i.e. demanded and created, and how this leads to growth and inflation, and therefore ultimately influences the level of interest rates. In addition, monetary theory explains the monetary policy of the central banks.

Interest rate expectations theory
Interest rate expectations theory explains the relationships between interest rates for shorter and longer maturities. In principle it follows the idea that a market participant receives a higher risk premium the longer they hold an investment versus holding a comparatively short-term investment. In the context of interest rate forecasting, this concept links the forecasts for short-term central bank rates with capital market yields for longer maturities.

Interest rate forecasting models
Interest rate forecasting models are econometric models that calculate future yield levels based on statistical data via the inclusion of factors such as growth and inflation expectations or specific market data. Such estimates provide an initial basis within the interest rate forecast, which is then supplemented by expert knowledge.

FACTORS RELEVANT TO INTEREST RATE FORECASTING

Fundamental factors

- **GDP growth**: The growth rates of a country should be seen a) in relation to the growth of similar economies, b) in relation to global growth and c) in relation to the country's historical growth performance. In addition, it is essential to find out whether a positive growth rate stems from healthy, sustainable development, or, for example, is based on a deficit-based fiscal policy and is therefore unsustainable. That requires a closer examination of the individual components of GDP growth (consumption, government spending, investment activity, exports and imports).

- **Inflation and Inflation expectations**: The rate of inflation is affected by national as well as external factors (commodity prices). Inflation and growth are key to determining a central bank's monetary policy direction and therefore have a massive impact on yield levels. Inflation expectations likewise play a major role and can force the central banks to act, even if the rate of inflation is not at a critical level.

- **Development of the labour market**: Although the labour market is a lagging indicator (the jobless rate only falls once the economy is already showing a palpable recovery), it does play an important role. Falling unemployment rates and the frequent, attendant rise in wages have a significant effect on consumption (and therefore growth) as well as the rate of inflation, and therefore on central bank policy on interest rates.

- **Budget deficit and fiscal policy**: The fiscal policy of a government plays a major role and has a key bearing on a country's economic performance. Furthermore, a country's fiscal policy has a significant effect on a) the liquidity of the local sovereign bond market, b) a country's credit rating and therefore c) the level of yields.

- **Regulation:** Besides traditional macroeconomic variables, the regulation of financial markets also has an important structural influence on the development of yields. For example, a change in the rules on liquidity and default risk in the banking sector affects the supply of and demand for government bonds, and therefore the level of yields. Similarly, changes to the rules within the insurance and pensions sector can affect the supply of and demand for government bonds, and therefore the level of yields.

- **External shocks/crises/natural disasters**: Lastly, changes in external variables such as a sudden change in the price of crude oil, geopolitical crises and natural disasters such as hurricanes, floods and wildfires have an impact on economic performance and therefore on the development of yields.

Monetary policy

The monetary policy of a country or economic region is influenced by economic factors (growth, inflation, labour market, financial market expectations), its mandate (inflation target) as well as external, global factors. Through monetary policy, a central bank has a direct influence on short-term interest rates and – in accordance with interest rate expectations theory – on yields for longer maturities.

- **Growth and inflation**: As described in “Theoretical basis”, growth, inflation and prevailing inflation expectations are the primary considerations for central bank policy. High growth rates and rising inflation tend to go hand in hand with more restrictive monetary policy (rising key interest rates), while central banks respond to low growth and falling inflation with expansionary policy (falling key interest rates). This also impacts accordingly on yields for longer maturities.

- **Mandate and credibility of the central bank**: The credibility of a central bank (including with regard to its mandate) is of critical importance from a bond-market perspective. In terms of interest rate forecasting, market participants pay particular attention to whether a central bank is in a position to achieve its inflation target, for example, and whether any measures designed to achieve this objective have been implemented and are working. The more credible a central bank, the more effective its policy and therefore the clearer and faster the response shown by capital market yields.

- **Extraordinary monetary policy**: Besides conventional monetary policy of managing inflation via key interest rates, central banks are now pursuing extraordinary measures in order to influence yield levels and therefore the development of inflation. Through quantitative easing, central banks purchase bonds in various fixed-income categories directly on the secondary market and consequently directly impact the level of market yields. Analysis and therefore the shaping of expectations via the extraordinary measures taken by central banks are now a firm component of interest rate forecasting.

- **Global monetary policy**: A central bank must incorporate global monetary policy developments into its considerations. For example, an extraordinarily restrictive stance can result in an undesirable rise in the value of the domestic currency. This in turn affects growth and inflation, and therefore the level of yields.

MARKET INFLUENCES

Fundamental factors resulting from the theoretical basis are just one pillar of interest rate forecasting. Other pillars include market sentiment (and therefore market positioning) and market expectations.

- **Market sentiment**: Various indicators can be helpful when assessing general market sentiment. These include interest rate differentials versus other fixed income categories, thus enabling the market’s risk appetite to be assessed. Implied volatility, risk reversals and volatility smiles are also helpful when assessing market sentiment. For example, these can be used to weigh up how the market would respond to specific changes in the economic situation, geopolitics and central bank policy, and whether interest rates would subsequently rise or fall.

- **Market positioning**: The market’s positioning is of major importance. For example, if the market has formed a general view that a central bank will cut key interest rates then it will favour long positions. But if the central bank disappoints and does not deliver the expected cut in interest rates, a counter-reaction can be expected and therefore a rise in yields. This may develop into a more extensive correction of expectations and must be mapped in accordance with its own expectations, particularly in the shorter rate-forecasting horizons.

- **Market expectations**: The situation is similar for market expectations regarding political events or the publication of macroeconomic data and indicators: a news item or data release will only really impact on yields if it exceeds general market expectations. Market expectations can also have an impact beforehand: for example, if the market begins to price in an interest-rate hike this will result in rising capital market yields.

SOURCES: DATA, STUDIES, INFORMATION

DZ BANK Research uses different access points in its interest rate forecasting. External data is used to assess markets and to populate models. In addition, forecast data is used to develop an interest rate outlook based upon this. Finally, news stories and economic research are used to refine and develop the expert opinion as part of a continuous process.

External data

- **Fundamental data**: Macroeconomic data is obtained mainly from data providers such as Datastream and Bloomberg. Data from international organisations such as the IMF and EU is also used. Key data is also available from national statistical offices and central banks. Care is taken to ensure that only reliable data is used. In the event of doubt, the analyst is required to verify the data from one particular source using different sources for confirmation.

- **Market indicators**: Exchange rates, interest rates, spreads, share prices, commodity prices, etc., are obtained from Datastream, Bloomberg and Reuters. The same applies to volatility indices, implied interest-rate volatility as well as other market indicators.

Forecasts

- **Macroeconomic forecasts**: Macroeconomic forecasts on inflation and growth or labour market developments, for example, are obtained from the Economics Department at DZ BANK Research.

- **Consensus forecasts**: Consensus forecasts on key data releases are meaningful to the extent that they can be used to estimate market expectations. Depending on where the forecasts of DZ BANK Research lie in relation to these consensus expectations, this will also influence the interest rate forecast. For example, if DZ BANK Research anticipates that the labour market will do better than the consensus expectations, this would point to a sharper rise in yields in the forecast than that expected by the market and which it has accordingly positioned itself for. Such information is illustrated within the expert opinion, particularly for the shorter forecast horizons.

Economic information

- **Media sources**: The latest news is obtained from media sources such as Bloomberg and Reuters.

- **Third-party providers**: Further information and analysis, which is used to refine the expert opinion and therefore the view on interest rates, is obtained from third-party providers such as Informa Global Markets and Market News International. News and information from print media and internet providers is also used.

» **Scientific analyses**: In addition, analysts obtain content from scientific analyses undertaken by universities, institutions such as central banks, the IMF and BIS as well as think tanks. This is used firstly to refine the expert opinion and secondly to ensure the forecasting work and methodology remain at the cutting edge of scientific knowledge.

FORECASTING PROCESS

The process of producing DZ BANK interest rate forecasts comprises five stages, at the end of which the generic yield curves for Germany (bund curve) and the US (UST curve) as well as the corresponding US and EUR swap curves are obtained.

Step 1: key interest rate forecast
Based on the macroeconomic forecasts of the Economics Department and knowledge of the current direction of monetary policy and response function of the European Central Bank as well as the Federal Reserve, a key interest rate forecast is produced for these central banks across the forecast period. The forecast stems mainly from the experience-based expert opinion.

Step 2: model estimates
In a second stage, using a statistical forecasting model an initial estimated figure for two and ten-year yield maturities of the bund and UST curves is calculated based on the key interest rate forecasts and other macroeconomic forecasts of DZ BANK Research and market data as input factors.

Step 3: mapping of expert opinion
The model result, as initial estimated figure, is supplemented by the experience-based expert opinion of DZ BANK Fixed Income Research. In principle, forecast models alone are not in a position to map various factors that influence the development of yields as they are either unavailable in data terms or are unseizable. This primarily concerns factors such as the risk appetite of market participants (geo)political influences as well as market expectations and positioning. The model forecast is then enhanced by these findings, which an analyst obtains in their day-to-day information processing.

Step 4: producing generic yield curves
Generic yields relate to fixed maturities in years and not specific financial instruments. Based on the forecasting of grid points, money market rates for maturities of under 12 months and generic yields of one through to ten-year as well as 30-year maturities are then calculated for the bund and UST curves via statistical methods. These statistical results are then reviewed again and adjusted if necessary based on the expert opinion.

Step 5: estimating swap spreads and producing swap curves
Once the benchmark curves for bund and US yields have been fully constructed, an initial estimated figure for US and EUR swap spreads (difference between generic bund/UST yields and corresponding swap rates) for the grid points is calculated using a statistical forecasting model based on this as well as other input factors. These

statistical results are then reviewed again and adjusted if necessary based on the expert opinion. The swap spreads for the other maturities are then calculated using statistical processes and reviewed once again in order to produce the US and EUR swap spread curves. US and EUR swap rate curves are then produced through the addition of generic bund/UST yields and swap spreads.

I. IMPRINT

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For defined share indices, share price forecasts are made at regular intervals. From the comparison between the current prices and the prepared forecasts on the development of such equity indices, **investment recommendations that are not generally definable and that cannot be defined in advance** may be developed.

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The assessment of an investment in a **currency area** is geared to the aggregate return expected from an investment in that **currency area**. As a rule, this aggregate return is primarily derived from the forecast change in the exchange rates. Aspects such as the general interest rate level and changes in the yield level of bonds on the relevant bond market that are possibly to be taken into consideration are also included in the assessment.
"**Attractive**" refers to the expectation that an investment in a currency area can deliver an above-average and positive return over a horizon of six to twelve months.
"**Unattractive** " refers to the expectation that an investment in a currency area can deliver only very low returns or even losses over a horizon of six to twelve months.
"**Neutral**" refers to the expectation that an investment in a currency area can deliver low or average returns over a horizon of six to twelve months.
The aforementioned returns are **gross returns**. The gross return as success parameter relates to bond yields before deduction of taxes, remunerations, fees and other purchase costs. This compares with the net return of a specific investment, which is not calculated and can deliver significantly lower returns and which measures the success of an investment in consideration of / after deducting these values and charges.

4.5 The prevailing factor for the **allocation of market segments** and **country weightings for covered bonds** is the comparison between a sub-segment and all the sub-segments on the relevant market as a whole:
"**Overweight** " refers to the expectation that a sub-segment can deliver a significantly better performance than all the sub-segments as a whole.
"**Underweight**" refers to the expectation that a sub-segment can deliver a significantly poorer performance than all the sub-segments as a whole.
"**Neutral weighting**" refers to the expectation that a sub-segment will not deliver any significant performance differences compared with all the sub-segments as a whole.

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For derivatives (**Bund futures, Bobl futures, treasury futures, Buxl futures**) the **arrows** (🡹) (🡻)(🡺) **merely indicate the trend direction** and **do not** contain **any investment recommendation**. The trend direction is derived solely from the use of generally recognised technical analysis indicators **without** reflecting **an analyst's own assessment**.

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Share indices (fundamental):	three months
Share indices (technical / chart analysis):	one week
Share indices (technical daily):	publicationday
Currency areas:	six to twelve months
Allocation of market segments	one month
Country weightings for covered bonds:	six months
Derivatives	
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Commodities:	one month

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