

# Anna Delikát: Role of financial markets in monetary policy

*For central banks, it is very important to know what economic agents, and more specifically financial market participants, think about monetary policy. Consequently, understanding financial market information represents an essential aspect of the MNB's monetary policy decisions, because it is an influential component of risk perception in terms of the opinion of the members of the Monetary Council in relation to the inflation forecasts adopted on the basis of fixed conditions. Short-term interest rate expectations can be defined relying on the MNB's estimate of the yield curve and market quotations. On the other hand, the analysis of long-term forward yields helps in drawing conclusions regarding the central bank's credibility and market agents' perception of the convergence process. For the assessment of foreign exchange market developments, the MNB relies on surveys concerning the equilibrium of the foreign exchange market and findings of the micro-structure theory. In order to identify the relation between exchange rates and yields, as far as the risk premium is concerned, shifts in risk appetite and default risks provide essential information, although the MNB frequently examines other factors as well.*

## FOREWORD

For central banks, it is very important to know what economic agents, and more specifically financial market participants, think about monetary policy. On the one hand, this is important because unforeseen monetary policy actions can alter expectations, while on the other hand, expectations provide a reliable reflection of economic agents' opinion on monetary policy in terms of credibility. Furthermore, analysis of financial markets is an important tool for central banks, as it helps to identify the relation between exchange rates and yields. The analysis of financial market indicators also influences the Monetary Council in its risk perception, which in turn has an effect on monetary policy.

In the first two chapters, we describe the key indicators the MNB uses to examine yields and exchange rates. The third chapter contains an overview of the relationships between exchange rates and yields through an examination of the risk premium.

Due to the space limitations, this article is restricted to showing only the framework of the analysis. Within the dimensions illustrated here the MNB frequently reviews numerous other factors to understand yields and exchange rates, and their relationships.

## YIELD CURVE

The central bank's ability to directly assert influence through its short-term (overnight, two-week) instruments is limited to

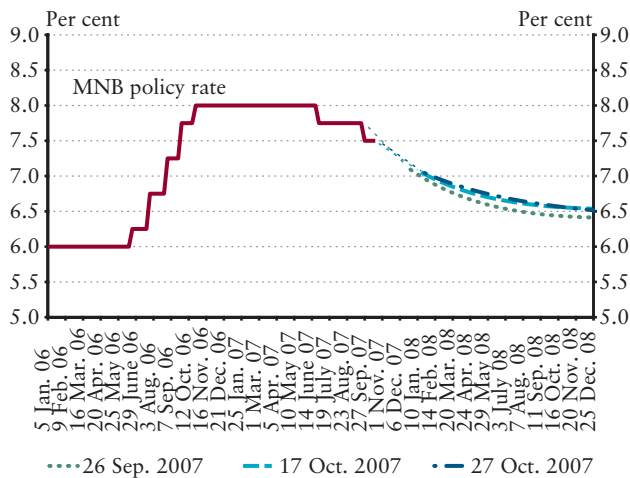
the shortest section of the yield curve. As durations grow longer, more emphasis is laid on the interest rate expectations of market agents and on the factors influencing the required premium. According to the expectation hypothesis, among spot yields, the forward yields derived under arbitrage-free conditions coincide with interest rates expectations. Consequently, market yields offer a good instrument for estimating the expectations of market agents in terms of the base rate path. As each market operates under different conditions (liquidity, turnover, agents, risks), different instruments are likely to result in different interest rate paths as well, according to which the MNB monitors changes in the prices of several different assets in its estimation of expectations.<sup>1</sup>

The cornerstone of any analysis of interest rate expectations is formed the government securities market. Relying on the prices quoted by dealers of primary government securities, the central bank constructs a (so-called zero coupon) yield curve each day with the distorting effects of bond coupon redemption payments duly eliminated.<sup>2</sup> In the process of construction, the resulting parameters may be used to produce the forward yield of any term. Of these, the MNB examines the series of two-week forward yields that shows the base rate path integrated into the market prices of government securities, meaning that it contains information concerning the expectations of market agents regarding the central bank base rate.

To define interest rate expectations the MNB uses other – directly observable – market yield indicators as well, such as

<sup>1</sup> For more information on the yield curve the MNB uses, see Gyomai-Varsányi (2002).

<sup>2</sup> Bonds are paid off in one lump sum, upon maturity.

**Chart 1**
**Policy rate expectations**


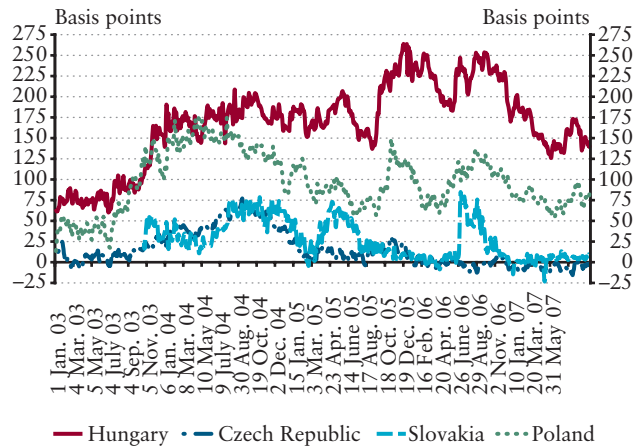
Notes: MNB estimated yields by the Svensson method.

Sources: MNB, ÁKK.

the three-month (discount Treasury bills) benchmark yield, and the three-month BUBOR offered on the interbank market, which is considered somewhat riskier than the government securities market. As this method does not provide information on developments in the interest rate path within a three-month period, using forward rate agreements (FRA)<sup>3</sup> to define the interest rate expectations offers a more accurate picture.

Central bank interest rates do not have an impact on long-term yields, and hence they are determined in principle by the expectations of market agents. As long-term yields are calculated as the result of expected real interest rates, expected inflation and the risk premium, any changes in these yields also function as a mirror, reflecting the credibility of monetary policy. Measures of lesser credibility usually result in higher long-term inflation expectations and surging long-term yields.

On the other hand, foreign investors tend to pay more attention to the premium of the financing currency (e.g. the euro) relative to the yields (extra yield), rather than to the nominal level of forint yields. Foreign investors play a major role in the liquidity status of the Hungarian government securities market (meaning that they are engaged in trading in Hungarian government securities), which also means that any shift in the yield levels in the major markets tends to influence forint yields, even if the premium remains unchanged. Therefore, the impact of local factors is better reflected in spot and forward premia than in nominal yields.

**Chart 2**
**Long-term forward interest rate premia in the region**


Source: Reuters.

Long-term forward premia reflect the long-term interest rate and premium expectations of market agents. For Hungary, the anticipated introduction of the euro constitutes a unique factor. After the introduction of the euro, short-term interest rates in Hungary will be the same as the interest rates in the euro area and, since foreign exchange risks will not exist any longer, no significant deviation is expected in long-term yields, as also indicated by previous events. In other words, the level of long-term forward premia could imply the horizon of market agents' expectations in terms of the introduction of the euro, and may also incorporate fundamental risks (e.g. budget, external balance risks) as well. To estimate the sustainability of external and internal balance, and the prospective date of introduction of the euro, most analysts tend to rely on the 5-year forward premium 5 years ahead relative to the euro forward yield rate, as this offers an indication of the position of the 5-year ahead 5-year yield of Hungarian government bonds compared to the same indicators in the euro area.

## FOREIGN EXCHANGE MARKETS

Apart from future expectations of market agents, changes in foreign exchange rates are also influenced by existing demand for forint and by the structure of *equilibrium of the foreign exchange market*. For this reason, the MNB closely monitors Hungary's external financing requirement.

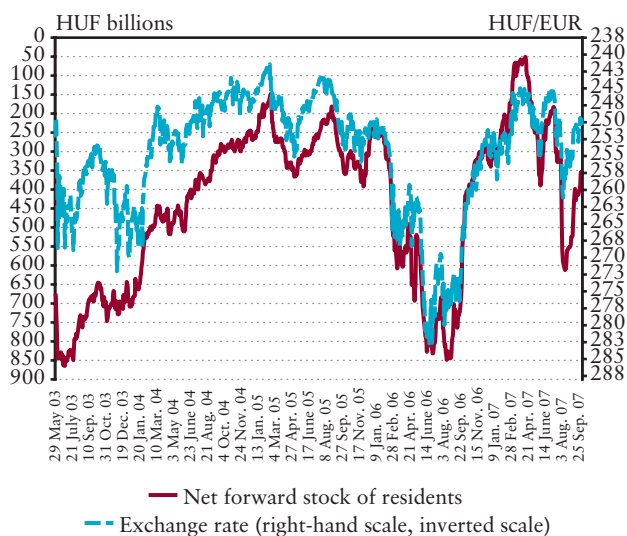
Reduction in the foreign indebtedness of domestic participants results in increasing demand for forints on the part of foreign participants. If the rate of demand for forints remains behind this type of exposure, it commonly results in lower exchange rates.

<sup>3</sup> Forward rate agreement means when the parties agreement on the amount of interest payable on a specific sum at a future date.

This observation is also supported by the *micro-structure* principle of exchange rates. Based on previous findings, the central bank is of the opinion that movements in the forint exchange rate depend to some extent on the dimension and direction of order flows (quantity of currency traded) between the quoting banks and their customers. In response to forint purchases by foreign participants, banks quoting currency market prices tend to move toward a stronger forint rate. As any movement in the overall exchange rate position of Hungarian banks is usually insignificant, the forint purchases or sales of foreign participants are offset by opposite transactions conducted by domestic participants. When the exchange rate rises, domestic non-bank participants (mostly export companies) are willing to cut back on their forward positions covering appreciation of the forint, and move to realise the profits on their hedging positions in anticipation of somewhat lower future gains. In consequence of this mechanism, the volume of derivatives held by domestic non-bank participants is usually closely related to the forint exchange rate.<sup>4</sup>

**Chart 3**

**Changes in exchange rates and in the exchange rate risk of domestic non-bank participants relating to their derivative holdings**



While the above fundamental analysis is suitable in principle for examining long-term movements in exchange rates, in order to describe short-term movements in exchange rates a technical evaluation is required, focusing on a geometrical analysis of trading in terms of prices and volumes.

The purpose of the technical analysis is to identify regular episodes (trends, formations, technical levels) in the exchange rates charts. Naturally, technical analysis has its limitations. As

fundamental shocks cannot be predicted, neither can the exchange rates movements which they tend to induce be foreseen. However, technical analysis can be used to describe movements in exchange rates between two fundamental shocks. As market participants use technical analysis to forecast exchange rate levels, the MNB also monitors developments in the key technical indicators of the exchange rate.

**RISK PREMIUM**

The link between exchange rates and yields is created by the correlation of uncovered interest rate parity, according to which the interest on two investments of the same term, one domestic and the other foreign, in a risk-free environment differs inasmuch as can be compensated by the expected movement in the exchange rate of the local currency. Expressed in terms of an equation:

$$R(\text{HUF}) - R(\text{EUR}) = E(\Delta S),$$

where  $R(\text{HUF})$  is the interest rate on the domestic investment,  $R(\text{EUR})$  is the interest rate on the foreign exchange investment and  $E(\Delta S)$  is the change in the exchange rate forecast for the period in question.

In reality, however, investors are facing numerous other risk factors as well, and they anticipate extra profit in exchange for the risks they take in their investments made in other currencies. Investors set the price of actual risks consistent with their willingness to take risks. Risk aversion indicates the size of the premium investors would like to see in exchange for a specific risk. Consequently, changes in the willingness of investors to take risks have the potential to alter the size of the required premium even if the risks remain unaltered. Hence, in an environment which is not free of risks, the equation of uncovered interest rate parity is supplemented with risks, and with risk aversion reflecting the perception of risk factors:

$$R(\text{HUF}) - R(\text{EUR}) = E(\Delta S) + (\text{actual risks} \times \text{risk aversion factor})$$

Changes in the interest rate premium can be measured accurately, and although of the variables situated in the right side of the equation the expected change in the exchange rates cannot be measured directly, its direction and dimension can be identified nonetheless from various surveys and from the strike prices of currency options. However, there are numerous factors which can have an impact on risks and risk aversion factors, in respect of which the information we have available is indirect at best.

<sup>4</sup> For more information on the micro-structure approach to foreign-exchange rates, refer to Gereben-Gyomai-Kiss M. (2005).

Therefore, the spread of a currency relative to other currencies depends on the exchange rate movements forecast by investors, on the magnitude of risks and the willingness of investors to take risks. There are different types of risks, such as default risk, exchange rate risk and liquidity risk. In the following we attempt to explain these risks and to demonstrate the methods the MNB uses to measure the various types of risks.

## Definition of risks

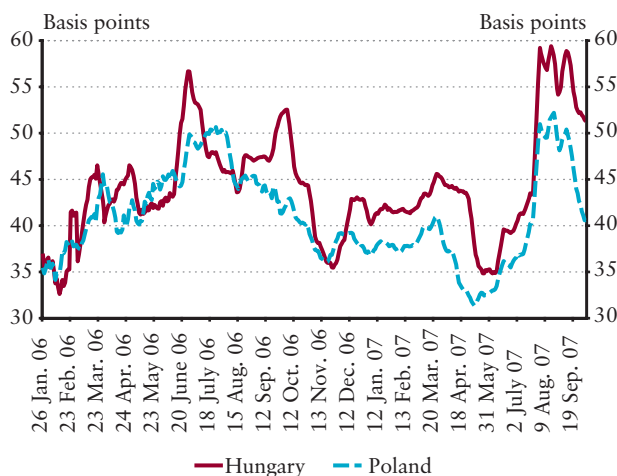
'Default risk' is when a debtor becomes insolvent, and hence becomes unable to repay to the investor the funds invested, including interest and principal, in part or in full. Although the state, as a debtor, is considered risk-free in connection with debts denominated in the local currency, where a foreign currency is involved there is always a risk for the state to default on its foreign exchange liability. There are rating agencies whose business is to monitor the default risks of different states. The credit rating of Hungary by major international rating agencies, in terms of investment category, is 'A2' (Moody's), and 'BBB' (Standard & Poor's), indicating that the default risk of the Hungarian state is low compared to several countries which are deemed riskier. Accordingly, the premium paid for the risk of insolvency represent only a few basis points. This premium is seen also in the premium of domestic foreign currency bonds relative to German and American bonds of similar maturity, and in the prices of credit default swaps (CDS, Chart 4), which are rapidly gaining popularity on the interbank markets.

The risks of foreign exchange assets, apart from default risks, are greatly influenced by *exchange rate risks*. As investors who are keen on risk aversion tend to choose the payment of a return with a lower level of volatility from among two similar ones, they expect to see a higher interest margin in return for tolerating a greater degree of uncertainty. Uncertainties may originate from the width (volatility) of the potential variance in the exchange rates, and from its asymmetry (skewness). The best source for obtaining the most information in these parameters of the exchange rate spread expected by market participants is the London options market on the forint-euro exchange rate.

In addition to default risk and exchange rate risk, investors face liquidity risk as well. A market is deemed liquid when large volume transactions can be executed on the spot without exerting any significant impact on prices. If an investor keeps assets in a market that is not sufficiently liquid, he may face the risk of being unable to close his positions at market prices at the time of his choosing.<sup>5</sup>

Chart 4

### Long-term euro-denominated Hungarian and Polish government bond spreads



Notes: Bonds mature in 2016; 5-day moving average.

Source: Reuters.

The liquidity of a market depends on a great many factors, which means that it cannot be described properly through only one indicator, as liquidity has to be measured along several dimensions to get a more accurate picture. The dimensions of market liquidity are either static (tightness, depth) or dynamic (resiliency, immediacy). These indicators should be treated collectively, as the various liquidity indicators may well emit contradicting signals about the liquidity of the market to which they pertain.

The so-called *tightness* dimension of liquidity means the transaction costs of trading. This particular dimension pertains to the ability of a market to bring together supply and demand, and the costs involved. The most typical factor is the difference between the purchase price and the selling price of the instrument in question, also known as bid-ask spread. The word 'tightness' signifies that the narrower this difference, the more liquid the market is.

Apart from tightness, the other key dimension of liquidity is the *depth* of the market, that is typically indicated by market turnover. The greater the turnover on a particular market, the more an investor can expect that his opening or closing of a position will not generate any significant exchange rate impact.

For all practical purposes, it is more difficult to comprehend the dynamic factors of liquidity by comparison to the static indicators. *Resiliency* offers an insight as to how fast prices are able to recover their 'balanced' value after being deflected

<sup>5</sup> For more information on the liquidity of Hungarian financial markets, see Csávás-Erhart (2005).

by a major transaction. On the other hand, the immediacy dimension focuses on how well the *immediacy* of a transaction is implemented on a particular market. Although an analysis of liquidity in these dimensions is not a simple undertaking in practical terms, nevertheless market turnover, the frequency of transactions, and the analysis of past developments from the standpoint of transactions offer some support from this perspective as well.

## Risk aversion

Investors usually weigh specific risks relative to their own *willingness to take risk*, meaning that, in addition to the instrument's specific risk, the price of a specific financial instrument depends to some extent on the investors' willingness to take risks. As investors' investment time horizon and risk management capabilities differ, any change in the composition of investors could have an impact on the price of a specific instrument. One example is what has happened in the market of Hungarian government securities, where since 2003 the previous dominance of long-term convergence investors has been largely replaced by a new breed of investors with a preference for short-term investments. These new investors change their exchange rate and interest rate positions more frequently, thus amplifying fluctuations in the prices of financial instruments.

Risk aversion is analysed in terms of global and regional impact. Changes in risk appetite on a *global* scale are determined mainly by the liquidity prospects of major markets and their outlook relating to the business environment. The most important are changes in the exchange rates, the central bank base rate, and the long-term yield of the currencies (dollar, euro, yen, pound sterling) used to finance forint-denominated instruments. Furthermore, the investment climate is also influenced by the business outlook indices of these economies (economic data, confidence surveys), as well as the prices of the most important minerals (oil, gold).

Another factor in setting the prices of instruments is the different approach toward certain geographical regions, apart from the global risk appetite in the wake of substantial movements of capital in the international investment sector, or toward groups of assets that may be compiled under a similar risk profile. This theory is supported, for example, by the correlation in the process of assets at the *regional level* or by the correlation between sovereign and corporate bond premia, which are of relevance from the perspective of Hungary in terms of credit risk rating. Therefore, with a view to understanding and predicting market trends, it is very important to be able to identify changes in risk appetite.

The best indicator of the global liquidity environment<sup>6</sup> is the yield level of American government securities. This also explains why global markets react so sensitively to any changes in the levels of American yields, irrespective of whether they are directly related to risk perception or not. For the most part, the flood of sales triggered recently in the emerging markets can be attributed to the higher American yields.

Global risk appetite is difficult to measure, and therefore, the complex hypothetical and empirical risk appetite indices calculated by investment banks and international institutions often convey different signals. Indicators reflecting the risk perception of a certain market segment or a homogenous group of assets tend to perform better. There are three different types of such indicators, a summary of which is contained in Table 1 below.

The first group of risk appetite indices relies on the price of the specific group of assets, more precisely, from the premium related to yields which are considered risk-free, such as those of the American government securities. If the premium increases, it means that risk appetite has declined for the group of assets in question. Although the higher premium could also signify an increase in asset-specific risk factors, the multitude of instruments covered by the indices

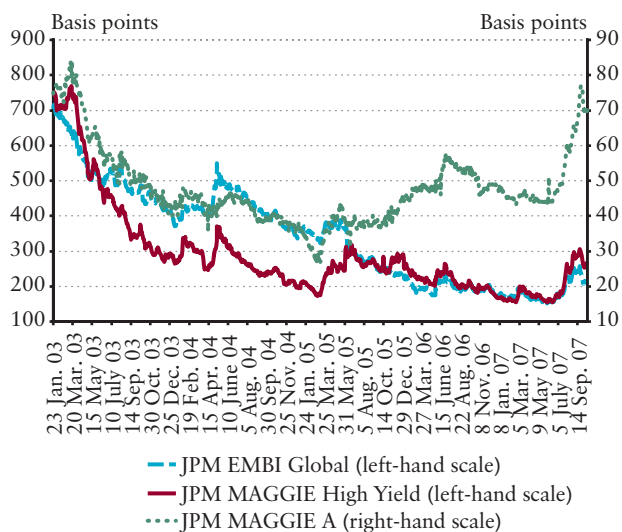
**Table 1**

### Relevance of risk appetite indices for the MNB broken down by markets

	Major markets (USA, EU, Japan)	Emerging markets	Region
Premium		X	X
Volatility	X	X	X
Surveys (allocation of assets)		X	X

<sup>6</sup> For the purposes of risk appetite, 'liquidity' commonly means – by way of derogation from the definition used in the previous chapters – the average yield level of the major markets. It is a risk-free rate of return serving as the basis for comparison as to the expected yield of all other investments. If the risk-free rate of return is too high, (tight liquidity) it generally results in lower demand for risky instruments. On the other hand, if the risk-free rate of return is too low, it enables market operators to reduce the costs of financing their investments, which in turn results in a better investment atmosphere and in lower costs of risks.



**Chart 5**
**Major bond index spreads**


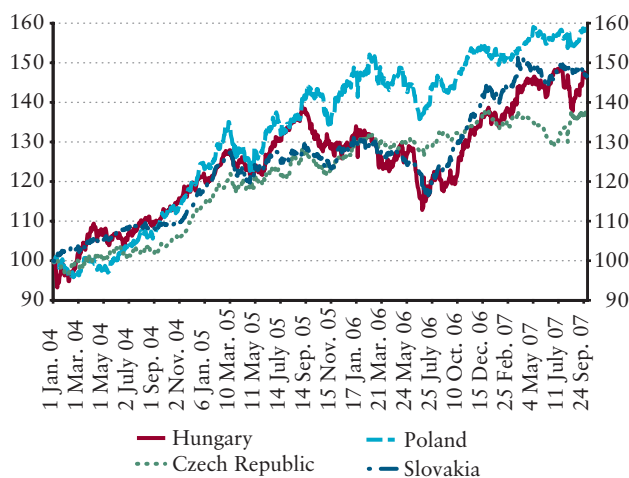
An increase indicates declining risk appetite, or increasing risk aversion.

Sources: Datastream (<http://www.thomson.com/financial/>); JP Morgan.

tend to diminish the weight of specific risks. The most commonly used indicator for the premia of emerging markets is the EMBI Global index. This index covers the debts of 33 emerging countries denominated in dollars. As for the Maggie indices, the one known as High Yield shows the premium on high-risk euro-denominated corporate and government bonds, while Maggie A indicates the risk appetite euro debts rated 'A' by credit assessment agencies. (Chart 5).

The second category includes the indices used for measuring the historic or expected volatility of asset prices. Notably, because the *volatility* of asset prices is likely to rise in cases when market uncertainties are also on the rise and risk appetite is declining. The volume of options deals provide an insight as to the degree of volatility expected by market participants, which could indicate foreseeable changes in risk appetite. Hence, for example, the projected increase in the volatility of the American stock market is shown by the VIX index, whereas the growth in the implied volatility of the American government securities market is conveyed by the MOVE index. The VXY group of indices show the implied volatility of G7 nations and currencies of emerging markets.

The third group of indices rely on surveys in an attempt to capture the mood of market participants. Certain surveys contain questions aimed directly at the expectations of market participants, while others draw their conclusions from the portfolio allocation of investors concerning risk appetite. This latter survey is commonly conducted by large investment banks among their own clients. The under- or over-weighting of certain groups of assets well demonstrates

**Chart 6**
**CEBI indices**


Notes: 1 January 2004 = 100; in euro.

Source: DrKW.

the assessment of certain groups of assets in terms of risks, or in terms of relative changes in such risks.

As for the indices providing an overall picture of certain market segments, one relevant indicator for the MNB is the CEBI index (Central European Bond Index) which reflects changes in the prices of foreign exchange and government bonds of the Visegrád Four, and shows the performance of the countries involved on the bond market in both euro and in local currency.

Recent developments in the CEBI index support the presumption that the yield expectations of foreign participants are a dominant factor in the prices of local instruments. Chart 6 shows that the bond markets of the Visegrád Four provided similar earnings to foreign investors over a period of several years. The lower nominal yield levels of certain countries were properly balanced out by decisive appreciation of foreign exchange rates. Due to the dominant role of foreign participants, changes in the required premium are characteristically accompanied by a drop in foreign exchange rates and higher bond yields.

## CONCLUSIONS

With a view to higher efficiency in monetary policy, it is essential for central banks to learn as much as possible about the financial markets and to analyse exchange rates and yields on a regular basis. This is especially true in the case of central banks operating in small, open economies, such as the MNB, since developments on global financial markets have a substantial impact on the local economy as well.

Furthermore, regular, routine analysis of the financial markets is essential as the structure of the markets changes rapidly in emerging markets, such as Hungary.

As exchange rates and yields are typically influenced by a variety of factors, it is necessary to examine a range of factors and indicators for the purposes of analysis. In order to be able to use market information properly, it is necessary to learn as much about the market in question as possible: therefore, the MNB routinely monitors developments in those markets in terms of efficiency and liquidity, as well as the behaviour of main market participants.

In the process of analysing market developments a broad spectrum of indicators must be reviewed by the central bank to obtain a better outlook on short-term market movements and long-term processes. This makes it easier to judge whether specific market information can be considered reliable, and which market segments deserve more attention.

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