Short-rate expectations and term premia: experiences from Hungary and other emerging market economies

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Abstract

This study focuses on the elements of short-dated forward yields in Hungary and other emerging market economies – short-rate expectations and the term premium – and the influences on their behaviour. The rate expectations are proxied by median values of analyst surveys. Principal components analysis shows that, during the sample period 2009–13, rate expectations and term premia in emerging market economies co-moved closely with the corresponding elements of US yields. The term premium appears to have been driven by global news events, and rate expectations less so. As for Hungary, the yield elements periodically followed the dynamics of factors in emerging market economies generally, but country-specific effects seem to have been important as well.

Keywords: Emerging markets, interest rate expectations, principal components, surveys, term premia

JEL classification: E43, E58, G15

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1. Introduction

Yields in financial markets are valuable sources of information for central banks and policymakers. An accurate assessment of the implications of the yield curve's level, shape and dynamics enhances the information base on which policymakers can rely, thus supporting the quality of their decision-making. The long-run trend in financial market yields is driven by economic fundamentals and the risks associated with such fundamentals. Nonetheless, a volatile yield environment can arise from a number of factors, including sudden changes in market sentiment, that are not necessarily justified by the economic fundamentals. Such volatility complicates the assessment of the yield curve.

Understanding the information in the yield curve has become more challenging since the 2007–08 financial crisis, after which central banks expanded their policy toolbox. In contrast to traditional interest rate policy – which sets the base rate and affects the yield curve through the usual monetary transmission channels – the unconventional measures of liquidity provision, quantitative easing and forward guidance each have distinct impact mechanisms. They influence different elements of longer-term yields; affect different maturity segments; and have varying effects on the yields of different instruments, such as government securities, interest rate swaps and corporate bonds. The cross-border effects of these new policy steps have also been significant, as evidenced, for instance, by the global impact of communications from the Federal Reserve in the summer of 2013 on scaling back its third quantitative easing programme (QE3).

In this paper, we investigate the main elements of yields in Hungary and in emerging market economies (EMEs) generally. Our focus is on the shorter, one- to two-year segment of the yield curve. We study the cross-border correlations of the yield elements and aim to explain how major news events contributed to their changes in the period 2009–13.

We follow the literature on yield curve term structures, which separates the two main elements of yields: future short-rate expectations and the term premium. The existence of the term premium implies that central banks need to take this factor into account when inferring market expectations from the yield curve. The empirical literature has generally found positive term premia, the size of which increases with maturity (eg Fama and Bliss (1987), Campbell and Schiller (1991)). Estimates of no-arbitrage term structure models also highlight the premium's time-varying nature (see Gürkaynak and Wright (2012) for a recent literature survey).

Empirical studies have linked term premia in the US to structural factors (eg the effect of quantitative easing), liquidity premia and the uncertainty of future short rates. The uncertainty factor may originate from two different sources. One is uncertainty about macroeconomic fundamentals – the future path of the economy. The other is uncertainty regarding the central bank reaction function. Backus and Wright (2007), for instance, attribute the "Greenspan conundrum" in 2004–05 (US long yields remaining low despite a significant increase in the short rate) to the effect of reduced uncertainty regarding both factors, which in turn reduced the term premium element of long-term yields.

Empirical work on EME term premia is scarce. Whilst there is a vast body of empirical literature on advanced country experiences regarding the term structure of interest rates, the lack of adequate data has probably hindered an extensive

analysis of emerging markets. Related, but still distinct topics of the forward premium puzzle and default risk term structures are available for the developing region.We contribute to the literature by assessing the common tendencies in EME short-rate expectations and term premia in the period 2009–13. We use survey forecasts to proxy short-rate expectations because such forecasts are available for a sufficiently large cross section of EMEs. We capture the common tendencies in EMEs by applying principal components analysis to both the survey forecasts and the term premium time series. In the next section of the paper, the resulting EME principal component time series are evaluated in terms of global news events during the period and in the light of US rate expectations and term premia.

Hungarian experiences are considered in the paper from two distinct perspectives. In Section 3, Hungarian rate expectations and the term premium are compared with their EME counterparts to assess how Hungarian data fit in with international tendencies. In Section 4, we evaluate how different sources of information about future rate expectations – such as yields on government bonds and forward rate agreements as well as survey forecasts – have performed in terms of predicting the short rate. Section 5 concludes by summarising the empirical results.

2. Emerging market short-rate expectations and term premia

Although there is a vast amount of empirical literature investigating the term premia of advanced economies, similar studies for EMEs are scarce.[2] This is probably due to the lack of adequate data. As shown, for example, by Kim and Orphanides (2007), popular regression-based methods of estimating the term premium are highly sensitive to sample selection because of the complexity of their data-generating process. No-arbitrage term structure models, another popular method for measuring premia, capture some of the complexity related to time variance, but they still require long time series of yields from a period that is homogeneous in terms of model parameters. For EMEs, the necessary multiple-decade time series are not available, and even if they were, structural breaks in the data-generating process would render interpretation of the estimation results problematic.

To circumvent the data problems of other methods, we use median values of analyst survey forecasts to proxy the expectation component of yields. Survey median values are model-free and are independent of the length of the time series. They can accommodate structural breaks in the yield's data-generating process. Survey data are also available for several EMEs. Although these survey forecasts are

[2] Some exceptions are, for Hungary, Gábriel and Pintér (2006); for Malaysia, Ghazali and Low (2002); for Brazil, Guillen and Tabak (2008); and for Poland, Konstantinou (2005).

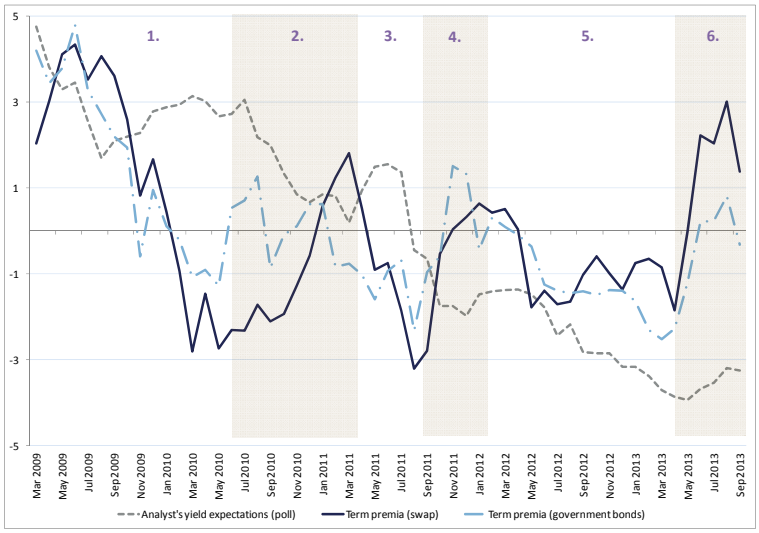
There is a larger empirical literature on EME interest rates examining the related topic of the forward premium puzzle (see eg Bansal and Dahlquist (2000) and Frankel and Poonawala (2010)). This exercise is less affected by data availability problems, however, as the comparisons are usually for interest rates of one (short) maturity. Another related literature segment that elaborates on EMEs is concerned with default-risk term structure modelling (eg Longstaff et al (2011)). However, instead of decomposing an expected short rate and the term premium, these studies aim to isolate pure default risk and a risk premium component.

available only for horizons of up to two years, this is the most relevant horizon in terms of central bank interest rate policy.

Nonetheless, survey expectations have several drawbacks. They may include observation and rounding errors; analysts may provide forecasts on the basis of different information (for example, due to delivering forecasts at different points in time); and they may target the mode of the expectation distribution, which may be different from the expected value.

EME rate expectations and term premia in interbank (FRA/IRS) and government bond markets

Figure 1



Turning points in EME term premia and key global events in the period 2009-13. 1: easing of the 2007–08 financial crisis; 2: first escalation of euro-area debt problems related to Greece; 3: Greece-EU deal and the beginning of the Federal Reserve's QE2 programme; 4: European sovereign debt problems in focus again, US loses AAA rating, Federal Reserve terminates QE2; 5: commitment of ECB, Federal Reserve QE3 programme; 6: potential tapering of QE3 programme.

Sources: Thomson Reuters; Bloomberg; authors' calculations.

Our data set consists of an unbalanced panel of monthly short-term forward rates sourced from Bloomberg. They are calculated from government bond/note yields, interbank rates – forward rate agreements (FRA) and interest rate swaps (IRS) – and analyst surveys in the period March 2009-September 2013 for 15 EMEs.[3] The one-year-ahead horizon was chosen for short-rate forwards and survey values.[4] Term premia were calculated as the difference between the forward yields and rate expectations. Unfortunately, due to differences in data availability in the country panel,[5] the levels of term premia are not comparable in the cross section.

[3] Colombia, the Czech Republic, Hungary, India, Indonesia, Israel, Mexico, the Philippines, Poland, Singapore, South Africa, South Korea, Thailand, Turkey and Russia.

[4] Quarter-end projections were available in surveys. In cases where the one-year-ahead horizon was not available, we interpolated survey data from the two quarters nearest to the one-year horizon. As base rate data change infrequently, the two-quarter data used in the interpolation were often equal.

[5] For most countries, one-month forwards were available in the case of the interbank market and three-month forwards were available in the case of government bond markets. Where these were missing, we used other tenors (three cases) of the same instruments. In one case, only FRAs were

Nevertheless, correlations among term premia indicators can still be interpreted because the direction of changes due to common shocks will be similar for different instruments, even if the sensitivity to shocks is dissimilar.

To pin down the common tendencies across EMEs with respect to rate expectations and term premia, we extracted the first principal components of the balanced subset of panels. Hence, three time series were created, one from analyst rate expectations and two from term premia (of government bond and interbank rates). Principal component analysis is useful because, by virtue of its construction, it extracts the factor that represents the largest proportion of the total variance in the data set and also because it filters out noise due to the forward data differences across countries and some of the data errors that may be present in the analyst survey data. Due to the importance of country-specific features (both real country differences and those due to the data), first principal components explained 30–50% of the total variance of the original variables.[6]

Regarding principal component time series, it appears that important global news events had a significant impact primarily on the dynamics of EME term premia. The principal component of EME term premia (both in the interbank and government bond market) usually increased during periods of higher uncertainty caused by events of economic importance, such as Federal Reserve and ECB decisions, stages of the euro area sovereign debt crisis, etc (Figure 1). By contrast, the principal components of EME rate expectations exhibited a gradual downward trend, and their response to global news events was more moderate.

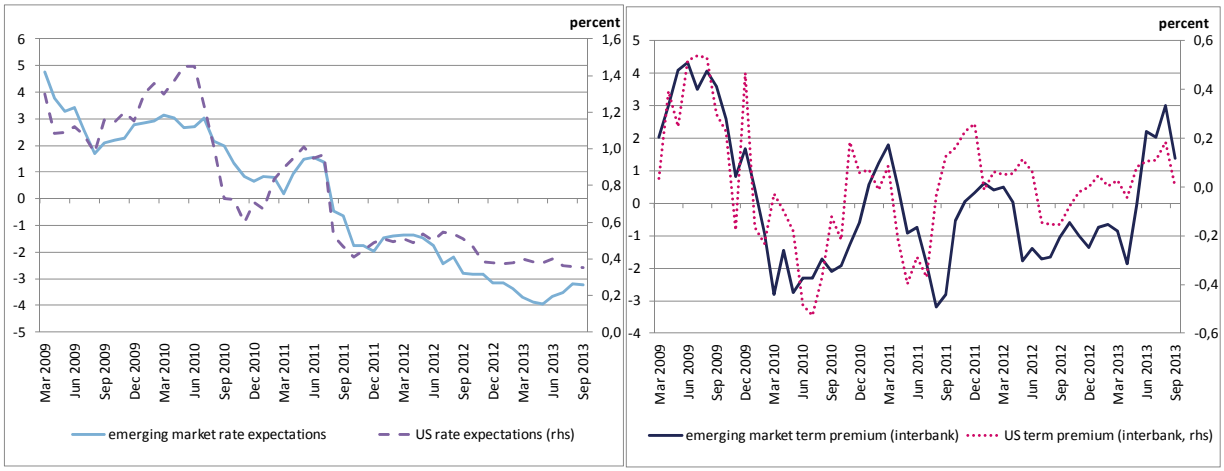
Relation to US yield components

Next, we compare the elements of EME yields – expectations and term premia – with similar indicators for the US. The rationale of this comparison is that the term structure of US yields has been studied intensively and we can therefore rely on this knowledge. Also, the US economy's impact on EMEs has been a recurring theme in financial economics. It is therefore interesting to see whether US rate expectations correlate with EME rate expectations (EME rate cycles coincide with those of the US). Also, factors influencing the US term premium (eg economic uncertainty or the Federal Reserve's quantitative easing) can theoretically affect both EME short rates (if EMEs react to accommodate external shocks through interest rate policy) and EME term premia or neither. So, which of these possibilities eventually occurred is an empirical question.

available and in another case OIS curve forwards were available. Analyst polls referred to the base rate in most countries, but there was one exception where forecasts of the three-month interbank rate were available.

[6] Using the sum of the first three principal components instead would have explained more than 70% of the total variances. However, there were no notable differences between, on the one hand, the dynamic patterns of time series created this way and, on the other, the first principal components. Thus, our description of EME factors' co-movement with global shocks, as well as with US and Hungarian yield components, are valid for such series as well.

US and EME yield components between 2009 and 2013 Figure 2



The EME term premium is the first principal component of interbank forward rates. EME rate expectations are the first principal component of EME poll medians. The principal components were scaled to the sample mean and standard deviation of the respective US yield component.

Sources: Thomson Reuters; Bloomberg; authors' calculations.

The need to assess the effect of the mechanism and magnitude of the Federal Reserve's quantitative easing programmes on the US yield curve has generated a surge of research on the US term structure.[7] Event-studies have examined price changes in US Treasuries during a short time period around important statements and news concerning the QE programmes. Model-based methods have instead aimed to use continuous samples and incorporate all other possible impacts (macroeconomic uncertainty, central bank policy uncertainty and liquidity effects). Depending on the method used, the studies have shown that the first programme (QE1) reduced the yield on the 10-year Treasury by between 40 and 110 basis points, while the reduction attributable to QE2 was estimated to be 15–45 basis points. Comprehensive studies on the impact of QE3 have not emerged yet, but the increase in yields on long-term Treasury securities in May 2013 attracted the attention of market analysts. Official communication about the possibility of reducing ("tapering") quantitative easing resulted in an increase in term premia and in the expected interest rate path, which contributed to the rise in US yields.

Figure 2 indicates a strong co-movement between the term premia in EMEs and in the US, and between indicators of interest rate expectations in the US and in EMEs. The rise in US term premia has generally coincided with an increase in term premia in EMEs, although in some cases the reaction occurred with a delay, which intuitively suggests causality running from the US to EMEs.[8]

Strong correlation can be observed between interest rate expectations in the US and in EMEs. This reinforces the finding that EME and US rate cycles have

[7] For example, Gagnon et al (2010), Hamilton and Wu (2012), Krishnamurthy and Vissing-Jorgenson (2011), Li and Wei (2012), Meaning and Zhu (2011), Wright (2012).

[8] The indicator of US term premia is noisier than the EME equivalent. This partly reflects the construction of the EME term premium indicator because principal components in EMEs filter out country-specific noise.

generally coincided. In recent years, however, as the US base rate has reached the zero bound, this relationship has weakened somewhat. Expectations for three-month US Libor rates have been stuck in the 0–0.5% range since 2011. Meanwhile, in EMEs, the decreasing trend continued until May 2013, followed by a small upturn.

Our data also suggest that, although it was a theoretical possibility, there was no significant co-movement between EME rate expectations and US term premia, or between US rate expectations and EME term premia. Thus, EME rates in the largest part of the sample did not react to shocks affecting US term premia. Apparently, the QE1 and QE2 programmes, which impacted US term premia, also spilled over into the term premium component of EME yields and left rates less affected. Nonetheless, the recent impact of QE3 tapering, which seems to have reversed the EME rate cycle (along with its large impact on EME term premia), points to a somewhat different mechanism.

3. Evolution of Hungarian yield components

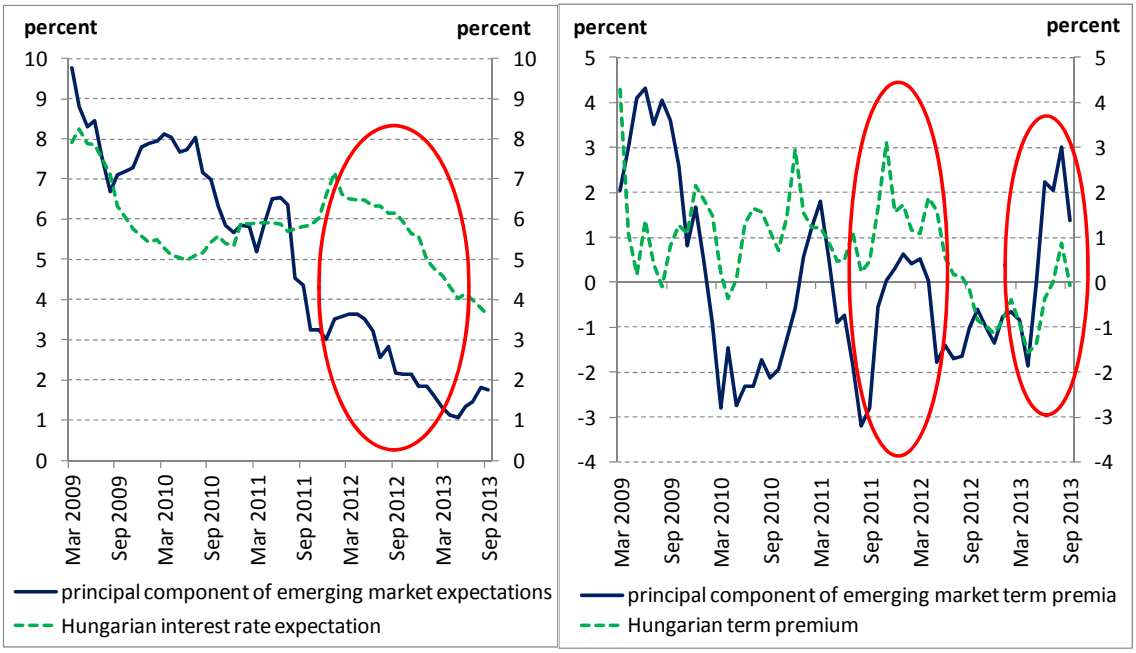
The methodology used so far provides policy-relevant information on two grounds. First, separation of the expectation and term-premium components of yields allows for a deeper understanding of the evolution of longer-dated yields in various domestic financial markets. Second, a comparison of Hungarian and EME yield components indicates how shocks of domestic and international origin have affected the Hungarian yield curve.

In a comparison of Hungarian and EME components, a lack of co-movement between domestic and emerging term premia, for example, would suggest that country-specific shocks were more important in the Hungarian premium. These shocks may be more relevant for policymakers than external effects, which are beyond policymakers' influence. But correlation does not imply causation. Co-movement between domestic and EME components could thus also be a consequence of the effects of country-specific shocks coinciding with the impact of global shocks on EME components. Therefore, an understanding of important global and domestic events is essential for interpreting these processes.

Figure 3 suggests that Hungarian yield components have occasionally moved with their EME counterparts, but this has not been characteristic of the entire period.

Regarding both Hungarian and EME expectations of short rates, there has been a general downward trajectory since early 2009 as the effects of the financial crisis has faded. However, the decline followed different paths in the 2010–11 period, hinting at the greater importance of country-specific factors. Increases in Hungarian rate expectations at the end of 2011 were attributable partly to renewed global imbalances (although in EMEs it was more the term premium component that increased and not rate expectations) and partly to country-specific events. The general downward trend in 2012–13 aligns with a similar trend in EME rate expectations, although country-specific events were also significant. The increase in EME rate expectations after May 2013 did not halt the downward trend in the corresponding Hungarian component.

EME and Hungarian rate expectations and term premia one year ahead Figure 3



The EME principal components have unit variance and zero mean by design. Here, for easier visualisation, we have scaled these time series to the respective Hungarian yield components. As a result, the figure can aid in gauging only correlation between EME and Hungarian variables; the levels and magnitudes of change of these variables are not comparable. EME expectations are derived from Bloomberg surveys; Hungarian rate expectations are the Reuters poll median values. Both Hungarian and EME term premia are calculated from interbank (FRA and IRS) forward rates.

Source: Thomson Reuters; Bloomberg; authors' calculations

The Hungarian term premium component has periodically co-moved with EME term premia. One such episode was between the end of 2011 and mid-2012, when global imbalances significantly – though only temporarily – raised both Hungarian and EME term premia. As mentioned above, Hungarian rate expectations were also impacted in that period. The Hungarian term premium decreased further in late 2012, when EME premia were already levelling off, indicating an improvement in Hungary-specific factors. In 2013, the global impact of the Federal Reserve's policy affected the Hungarian term premium but not rate expectations.

4. Monitoring interest rate expectations in Hungary

From the viewpoint of a central bank, one key objective of analysing the yield curve and its term premium component is to gauge market expectations of future rates. In this section we turn to this issue and look at yields as key sources of information about future short rates. We use a different methodology than before. Rather than identifying the term premium using analyst surveys, we infer the term premium from the historical performance of yields in predicting future short rates.

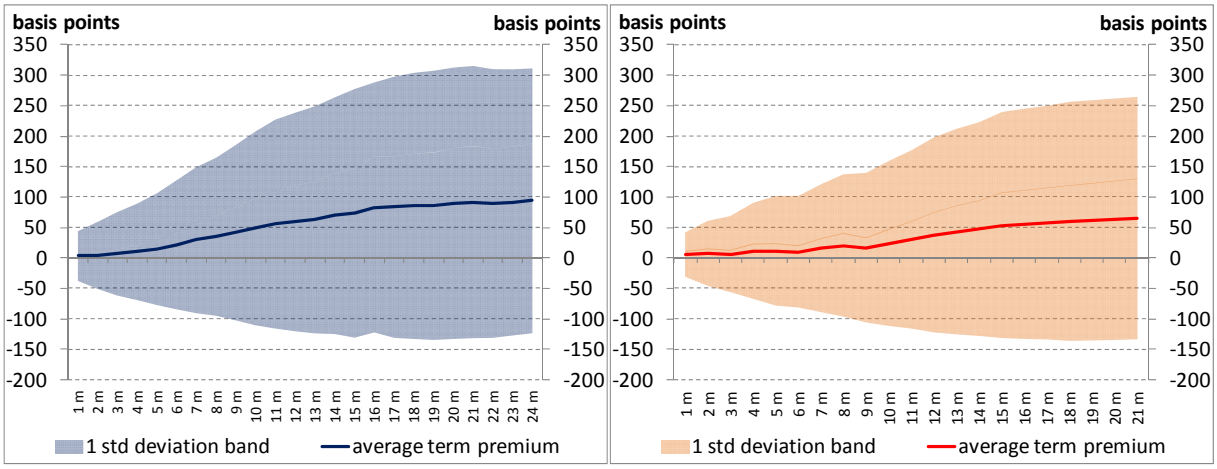
In Hungary, there are three major sources of information regarding expectations of short-term interest rates: yields on government notes and bonds; interbank rates (FRA and IRS); and analyst surveys. Medians of analyst survey results can be interpreted as a straightforward measure of rate expectations, but forward

rates calculated from government bond yields and interbank rates contain a term premium. Here, we choose a direct measurement of the term premium component: we compare forward short rates with realised short rates. If a systematic bias is identifiable, this forecast error can be considered as the term premium.

We use data for the 10-year period between January 2004 and December 2013, as reliable data for the Hungarian FRA market is available only after 2003.

Average term premium in the government securities market (left panel) and in the FRA market (right panel)

Figure 4



Sources: Thomson Reuters; authors' calculations

Our calculations suggest that, on average, the term premium was positive and increased with maturity, both for government securities and for the FRA market (Figure 4). However, the forecast error of forward rates fluctuated in a wide range during the period, as illustrated by the sizable one-standard-deviation bands. Thus, the term premium estimates for distinct periods can differ considerably. In the case of FRA rates, the average term premium was half the size of the term premium in government bond yields and for the shortest maturities was close to zero. Our results are in line with the conclusions of Gábriel and Pintér (2006), who conducted a similar analysis for government bond yields using a different sample period, running from 2001 to 2006.

To assess the reliability of the three information sources for predicting the future short rate, we run a Diebold-Mariano (DM) test.[9] This test performs a pairwise comparison of forecasting methods' predictive ability. To allow for differences in predictive ability at various horizons, we divide the available two-year forecasting horizon into four half-year segments and perform the DM test for each segment.

[9] The Diebold-Mariano test compares two methods' forecasting errors by calculating the average of the forecasting error differences and testing whether this value is significantly different from zero. The test accounts for autocorrelation of forecasting errors, for example due to overlapping forecast periods. See Diebold and Mariano (1995) for details.

Results of the Diebold-Mariano forecasting test on four forecast horizons Table 1

	1–6 months			7–12 months			13–18 months			19–24 months		
	Random walk	FRA	Gov. yields	Random walk	FRA	Gov. yields	Random walk	FRA	Gov. yields	Random walk	FRA	Gov. yields
survey	–3.49*	0.53	–1.86*	–2.75*	1.07	–2.34*	–1.96*	–0.47	–1.94*	–3.54*	–0.48	–1.56
gov. yields	–7.15*	1.28		–0.91	3.03*		–2.25*	2.19*		0.34	4.35*	
FRA-s	–9.47*			–2.63*			–2.52*			–1.82*		

* Significance at the 5% level. Negative values signal a higher forecasting accuracy of the method in the row heading, while positive values signal a higher forecasting accuracy of the method in the column heading.

Sources: Thomson Reuters; Bloomberg; authors' calculations.

First, we compare the three information sources with the random walk specification for the four horizons. The random walk specification assumes that the last available value of the short rate is the best forecast of future values. This is useful for assessing whether the forecasting power of each of the three methods is significant at all. Our results suggest that the short-rate paths implied by FRAs and analyst forecasts have significant forecasting power at all horizons (up to two years), ie both of them beat the random walk specification. By contrast, the forecasting ability of government bond yields is significant in only two maturity segments.

Next, we test the three information sources against each other. Table 1 summarises the results. We find that the forecasting power of FRAs and analyst forecasts is similar at all horizons. In contrast, forecasts based on government bond yields prove to be significantly worse at three of the four horizons.

From a theoretical point of view, the weak forecasting performance of government bond yields relative to FRAs may be a consequence of two factors: the higher liquidity risk of government security investments, and the asymmetry of investment positions in this market. FRA contracts have considerably lower liquidity requirements than government security investments because interest rate positions in FRA deals can be taken without transferring the face value; usually only a fraction of this is needed for initial margining. Furthermore, the amount of short positions in the government bond market is less relevant, and therefore most investors assume a long bond position. This leads to a higher risk of systemic liquidity shocks as increasing interest rates cause market-wide losses and can cause and reinforce a sell-off. By contrast, in the case of FRAs, position-taking is symmetric (the values of short and long investment positions are equivalent), so losses and gains are also more balanced between market participants.

These two key features resulted in the larger volatility of government yields relative to interbank rates in Hungary. The volatility has been greater in the bond market in both turbulent and relatively calm periods. As Figure 4 shows, the forecasting bias (a measure of the term premium) has on average been larger and also more volatile in this market. A more thorough examination of the data than is presented here reveals that the weaker forecasting ability of government bond yields is strongly related to their performance in the 2008-09 period, when the Hungarian government bond market was hit by several shocks.

5. Conclusions

Financial market yields are important sources of information for central banking and economic policy. Separation of their main constituents – rate expectations and term premia – is useful for monitoring market forecasts of future rates as well as for gauging general risk perception and monetary conditions in various financial market segments.

This paper adds to the empirical literature by using principal components analysis to assess the tendencies in EME term premia in the period 2009-13. We choose surveys to proxy rate expectations and to calculate the term premia in forward rates. In doing so, we circumvent the problem of data availability for EMEs that prevents the use of other popular methodologies. However, short forecast horizons in the surveys restrict our analysis to the shorter-dated segment of the yield curve.

The first principal component of EME rate expectations shows a trend decline in the sample period. By contrast, the principal component of EME term premia – seems to have fluctuated consistently with major global news stories. The Federal Reserve's communication regarding its QE3 measures in 2013 also mostly impacted the term premium element of EME yields. We found that both EME term premia and rate expectations co-moved closely with their counterparts in US yields.

As for Hungary, the rate expectations and term premia only periodically moved in tandem with EME yield factors. This suggests the importance of country-specific events in shaping Hungarian yield components, at least at short maturities. Some co-movement can still be seen; notably, the decline in Hungarian rate expectations in recent years was accompanied by decreases in EME rates, and the Hungarian term premium appears to have been affected by external shocks at end-2011 and in mid-2013.

Regarding Hungarian markets, both government bond yields and interbank rates contained positive term premia based on the difference between forward rates and realised rates. The average premium and its volatility was larger in the government bond market, probably as a consequence of liquidity factors. Based on our tests assessing the power to predict future short rates, FRAs and analyst surveys were better at gauging market expectations, while government bond yields provided negligible additional information.

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