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Hungary's eurozone entry date: what do the markets think and what if they change their mind?

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Abstract

Dates for euro adoption suggested by national authorities in accession countries are currently receiving a lot of attention. Financial markets form their own expectations about eurozone entry dates, which in turn get priced in asset prices such as long-term bond yields and the exchange rate. If, for some reason the convergence process gets derailed, it may trigger a revision of entry date expectations. Because of the forward-looking nature of financial markets, such a revision may affect current monetary conditions. The potential size of these reactions is of primary interest for the central bank, especially before entering ERM II. Our paper presents a simple analytical framework based on a risk premium-augmented UIP condition with which the potential magnitude of the reaction of long-term yields and the spot exchange rate to a shift in entry date expectations can be quantified. Our findings suggest that the size of the reactions depend on (1) how far the entry date is postponed (2) how far current inflation is from the Maastricht-satisfying level and (3) whether the credibility of the central bank's target inflation path is sensitive to changes in the expected entry date. In the empirical part of the paper, we derive market expectations of the eurozone entry date from the Hungarian and eurozone yield curves and compare the actual changes in monetary conditions with those predicted by our method.

Introduction

In the middle of 2003, the Hungarian government with the support of the Magyar Nemzeti Bank (MNB, National Bank of Hungary) set 1 January 2008 as the target date for Hungary to join the eurozone. Before introducing the euro, however, Hungary must fulfil the so-called Maastricht convergence criteria. If a change in the circumstances persuades markets that Hungary cannot fulfil the criteria on time, the expected entry date may be shifted out. Because of the forward-looking nature of financial markets, such a revision may affect current monetary conditions, i.e. the spot exchange rate and long-term yields. The potential size of these reactions is of primary interest for the central bank, especially since Hungary will soon have to make strategic decisions about the timing and conditions of ERM II participation and start negotiate them with its European partners.

The paper is organised as follows. Section I describes a simple method with which we quantify the potential consequences of an adverse shift in the expected entry date for the spot exchange rate and long-term interest rates. Section II provides an assessment of the markets' view on the eurozone entry date using information from forint and euro yield curves. Section III presents an ex post comparison of the developments of the expectations, the exchange rate and long-term yields with the changes predicted by our method. Finally, Section IV concludes.

I. Potential consequences of an adverse shift in market expectations

When analysing the impact of expectations on monetary conditions, we focus on two factors: future currency risk premia and inflation. More precisely, we try to assess the potential magnitude of changes in the expected future path of the currency risk premium and inflation triggered by an outward shift in the expected date of adopting the euro. These changes can then be translated into a depreciation of the spot exchange rate and an increase in long-term interest rates, using a risk-premium enhanced version of the UIP condition.

I.1 *Currency risk premia during the run-up to the euro*

The UIP condition (1) suggests that the differential between nominal interest rates on domestic and foreign (euro-denominated) bonds ($i_t - i^*_t$) equals expected depreciation ($E_t(s_{t+1}) - s_t$), the currency risk premium (ρ_t) and the default risk premium.[1] As the default risk on Hungarian sovereign bonds is already quite small and is expected to change only little in the run-up to the euro, this term is suppressed in the following.

$$i_t - i_t^* = E_t(s_{t+1}) - s_t + \rho_t \qquad (1)$$

The future path of the currency risk premium in accession countries with flexible exchange rate regimes or wide-band pegs can plausibly be divided into three stages. *Stage 1* is the pre EU-entry period, where currency risk is relatively high. The country is basically classified as an emerging market, and as such, is prone to sudden swings in investor sentiment and financial contagion. Prospective entry into the EU and later the eurozone have some stabilising property on long-term expectations and the country in this stage is often called a 'converging' market. Nevertheless, EU and eurozone entry dates are both uncertain or distant at this stage, so their stabilising effect is rather limited.

Stage 2 is the period between EU-accession and the adoption of the euro. Currency risk is lower here, as the country has become a member of the EU, i.e. it has already got through a major potential obstacle on the way to the euro. Securing EU-membership depends not only on domestic economic policy, but on a lot of political factors as well. Many of these are external in nature and out of the influence of the candidate country. Once in the EU, it is up to the given country only to meet the Maastricht criteria and introduce the euro, which greatly reduces the uncertainty about the timing of the latter. The efforts to meet the Maastricht criteria strengthen expectations of general macroeconomic stability. They also mean that the country is better able to differentiate itself as a 'converging' economy and may get more insulated from financial contagion coming from emerging markets. The extent to which prospective eurozone entry

[1] Foreign variables are denoted with an asterisk. An increase in s_t means a depreciation of the domestic currency.

stabilises exchange rate expectations is much more pronounced at this stage compared with *Stage 1*. Added to this is the positive impact of ERM II membership on exchange rate stability because then the ECB will also protect the intervention band besides the MNB. Nevertheless, there remains some uncertainty, as the efforts to comply with the Maastricht criteria may be derailed. Even at this stage, markets may test commitments to exchange rate stability as illustrated by the example of a number of Western European countries at the time of the ERM crises.

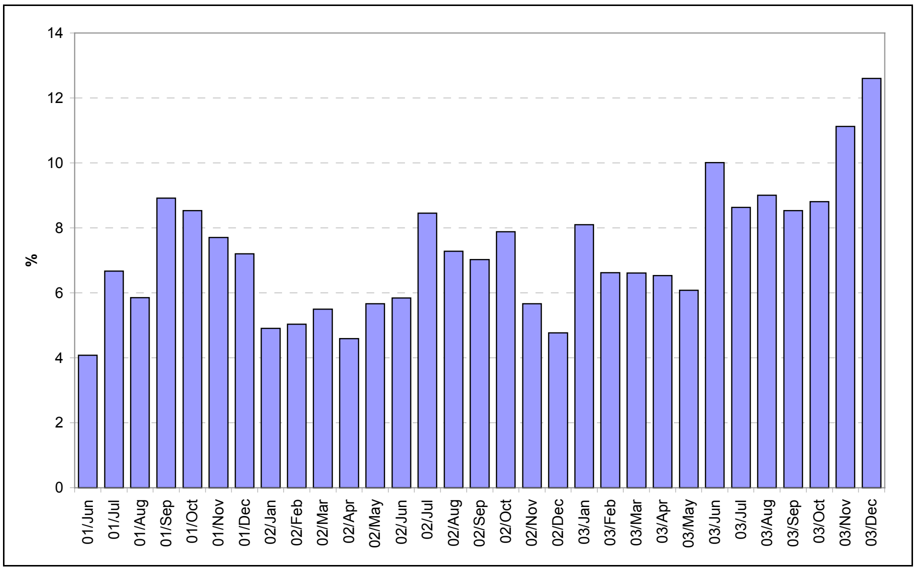
Finally, *Stage 3* is the period of full EMU membership. The euro is introduced and the currency risk premium component of domestic yields disappears completely.

What is of interest here is the magnitude of the currency risk premium in *Stage 1* and, particularly, in *Stage 2*.

The spot currency risk premium can be calculated from (1) if one has information about exchange rate expectations. In Hungary, Reuters conducts a monthly survey of market participants in which expected exchange rates for different horizons are collected. Using the averages of exchange rate expectations from the survey, the spot exchange rate as well as one-year forint and euro zero-coupon yields, a time series of one-year currency risk premia was calculated for the period since the exchange rate band was widened (Chart 1).

The observed premia ranged between 400-1200 basispoints, with an average of 720 basispoints. This is higher than the usual size of premia in the narrow-band crawling peg regime prevailing between 1995 and 2001. However, this is quite natural, given the wider band and the continuously strong position of the forint within it. According to these observations, 700 basispoints were taken as the representative currency risk premium in the pre-EU *Stage 1*.

Chart 1: Observed one-year currency risk premia since the band-widening



Because of the uncertainty about the future, it is extremely difficult to estimate the size of the currency risk premium in *Stage 2*. To assess the potential magnitude of this premium we use two proxies: implied forward differentials for the post EU-entry period for Hungary and pre-EMU interest rate differentials of current EU member states.

As far as the first proxy is concerned, using implied forward differentials for 2005 seems appropriate, as EU-membership by then is certain, but euro introduction has zero probability. The year 2006 can be regarded suitable with the same argument, but implied forward differentials for later years are of limited help, since eurozone entry may be discounted into them with some probability. A further assumption necessary to use implied forward differentials as a measure of future risk premia is that the currency depreciation expected for that particular year is zero. Though these implied forward differentials showed a very strong volatility in recent years, their historical averages can be useful in assessing the potential size of the future currency risk premium. Between 2000 and 2003, the average of observed implied forward differentials for 2005 was 294 basispoints and for the year 2006 it was 230 basispoints.

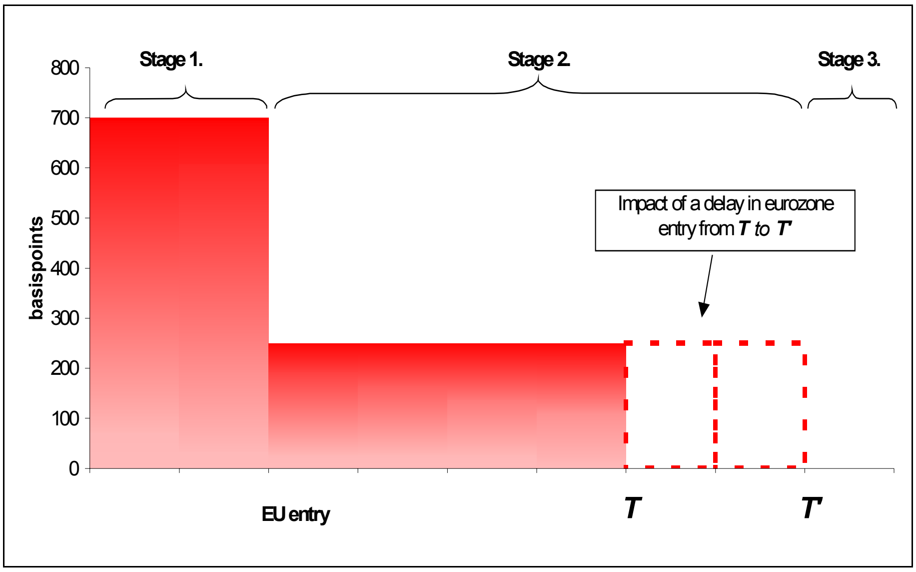
Chart 2:One-year implied forward differentials for 2005 and 2006

Regarding our second proxy, one could look at Sweden's current interest rate differential vis-á-vis the eurozone. Swedish short-term interest rate differentials are around 75-100 basispoints. This is lower than the levels of Hungarian forward differentials, but Sweden is already an EU-member and currently meets all the Maastricht criteria (apart from participating in ERM II). From this point of view, pre-EMU interest rate differentials of countries like Portugal, Spain, Italy and Greece seem more relevant for Hungary. In the years prior to the launch of the eurozone, short-term interest rates in these countries were 200-300 basispoints higher than those in Germany.[2] To sum up, 250 basispoints seems a plausible assumption for the size of the *Stage 2* currency risk premium in Hungary.

The stylised time profile of the currency risk premium assumed for the path to eurozone entry is sketched in Chart 3. In the profile that market participants actually expect, the big drops are probably smoothed out, but for our analysis it is not the actual shape of the profile but the area under it which is important.

[2] See *Csajbók* and *Csermely*, eds. (2002)

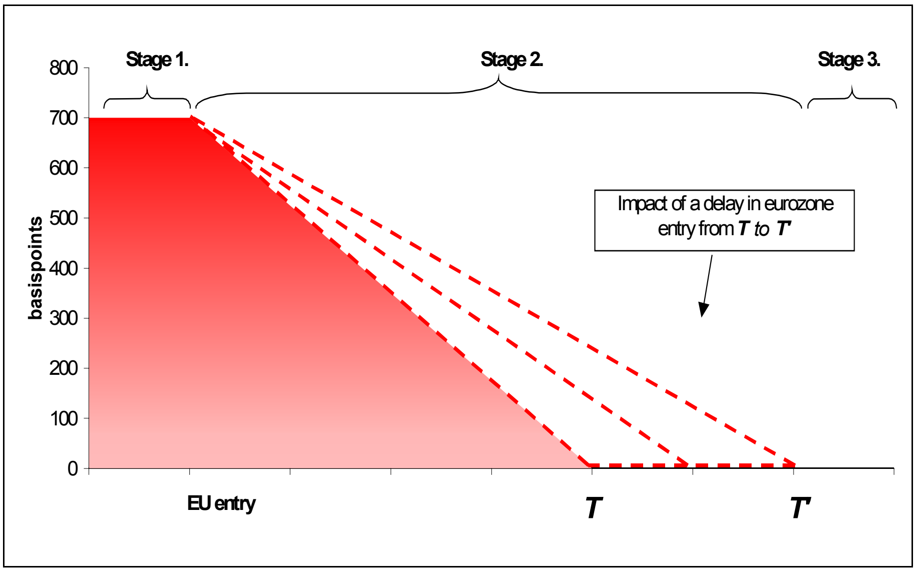
Chart 3: Stylised time-profile of currency risk premia in the run-up to EMU



If the expected date of eurozone entry shifts out by *x* years, the sum of one-year currency risk premia from time t to eurozone entry increases by *x* times the *Stage 2* risk premium, that is *x* times 250 basispoints, as depicted in Chart 3. The increase in the cumulated risk premium may depreciate the spot exchange rate and/or increase spot long-term interest rates depending on what the market thinks about the reaction of monetary policy.

We also present an alternative stylised time-profile, where the risk premia are assumed to fall continuously instead of showing discrete jumps. In this case the impact of a postponement of *x* years is *x* times 350 basispoints. Since there are arguments against and in favour of both scenarios, we calculate with a range of 250-350 basispoints instead of choosing either of them.

Chart 4: Alternative stylised time profile of currency risk premia



I.2 *A simple framework for analysing the effect of entry-date expectations on monetary conditions*

By expressing s_t from (1) and iterating expectations forward up to the expected eurozone entry date (T), we get:

$$s_t = E_t(s_T) - E_t \sum_{\tau=t}^{T-1} (i_\tau - i_\tau^*) + E_t \sum_{\tau=t}^{T-1} \rho_\tau \qquad (2)$$

The entry date nominal exchange rate (s_T) equals the sum of the initial real exchange rate (q_t), the cumulated change in the real exchange rate (dq_t), the initial price level difference (p_t - p_t^*) and the cumulated inflation differentials (π_t - π_t^*):

$$s_T = q_t + \sum_{\tau=t+1}^{T} dq_\tau + p_t - p_t^* + \sum_{\tau=t+1}^{T} \pi_\tau - \sum_{\tau=t+1}^{T} \pi_\tau^* \qquad (3)$$

The change in the real exchange rate (dq_i) in period i can be decomposed into a term purged of the long-run trend ($d\tilde{q}_i$) and a trend appreciation ($-b$):[3]

[3] Where b is positive and can be interpreted as the annual percentage appreciation due to the Balassa-Samuelson effect.

$$dq_i = d\tilde{q}_i - b \tag{4}$$

We introduce a new variable $\tilde{\pi}_i$, which is the difference of home inflation (π_i) and b:

$$\tilde{\pi}_i = \pi_i - b \tag{5}$$

Equation (3) can be transformed into the following form using (4):

$$s_T = q_t + \sum_{\tau=t+1}^{T} d\tilde{q}_\tau - \sum_{\tau=t+1}^{T} b + \sum_{\tau=t+1}^{T} \pi_\tau - \sum_{\tau=t+1}^{T} \pi_\tau^* + p_t - p_t^* \tag{6}$$

Equation (5) implies that:

$$\sum_{\tau=t+1}^{T} \tilde{\pi}_\tau = \sum_{\tau=t+1}^{T} \pi_\tau - \sum_{\tau=t+1}^{T} b \tag{7}$$

Applying (7) and introducing a new variable for the real exchange rate purged of the long-run trend ($\tilde{q}_T = q_t + \sum_{\tau=t+1}^{T} d\tilde{q}_\tau$), equation (6) can be rewritten as:

$$s_T = \tilde{q}_T + \sum_{\tau=t+1}^{T} \tilde{\pi}_\tau - \sum_{\tau=t+1}^{T} \pi_\tau^* + p_t - p_t^* \tag{8}$$

Substituting (8) into (2), we get the following expression for the spot exchange rate:

$$s_t = E_t(\tilde{q}_T) - E_t \sum_{\tau=t}^{T-1} (i_\tau - i_\tau^*) + E_t \sum_{\tau=t}^{T-1} \rho_\tau + E_t \sum_{\tau=t+1}^{T} (\tilde{\pi}_\tau - \pi_\tau^*) + p_t - p_t^* \tag{9}$$

Without restricting generality we can normalise ${i^*}_t$, π_t^* and p_t^* variables to zero, so that i_t, $\tilde{\pi}_t$ and p_t denote the difference of home and foreign variables:

$$s_t = E_t(\tilde{q}_T) - E_t\sum_{\tau=t}^{T-1} i_\tau + E_t\sum_{\tau=t}^{T-1}\rho_\tau + E_t\sum_{\tau=t+1}^{T}\tilde{\pi}_\tau + p_t \qquad (10)$$

Equation (10) illustrates the connection between market expectations about eurozone entry date (*T*) and the spot exchange rate. If the expected entry date is shifted out by one year, the spot exchange rate can be written as:

$$s_t' = E_t(\tilde{q}_{T+1} - \sum_{\tau=t}^{T} i_\tau' + \sum_{\tau=t}^{T}\rho_\tau' + \sum_{\tau=t+1}^{T+1}\tilde{\pi}_\tau') + p_t \qquad (11)$$

Thus the impact of a revision of entry date expectations on the spot exchange rate is:

$$s_t' - s_t = E_t\left[(\tilde{q}_{T+1} - \tilde{q}_T) - \sum_{\tau=t}^{T-1}(i_\tau' - i_\tau) + \sum_{\tau=t}^{T-1}(\rho_\tau' - \rho_\tau) + \sum_{\tau=t+1}^{T}(\tilde{\pi}_\tau' - \tilde{\pi}_\tau) - i_T' + \rho_T' + \tilde{\pi}_{T+1}'\right] \qquad (12)$$

Suppose that the market expects that the authorities will try to enter the eurozone at an 'equilibrium' real exchange rate ($\tilde{q}_T$), which does not depend on the entry date.[4] We also assume that inflation remains on the Maastricht level once it fell to that level, i.e. it does not jump up after the qualification period for the eurozone entry is over and the country adopts the euro. Then $\tilde{\pi}_{T+1}'$ can be regarded close to zero if the Maastricht-fulfilling level of inflation equals the sum of foreign inflation and the Balassa-Samuelson appreciation (*b*) and provided that the inflation criterion has to be met in period *T+1* even if the entry date is shifted out by one year. In this case, if expectations about *T* are shifted out, the change in the spot exchange rate depends on how the cumulated short interest rate differentials, risk premia and inflation differentials change as they are summed to *T+1* instead of *T*.

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[4] Note that the Balassa-Samuelson equilibrium appreciation is filtered out from $\tilde{q}_T$; see (4).

To be able to derive the exact paths of s_t, i_t and π_t, (12) is obviously not sufficient. If not a full macro model, one would need at least an equation describing inflation dynamics and a monetary policy reaction function to obtain these. To calibrate such equations is beyond the scope of this paper.[5] Here we only want to gauge the potential magnitude of the initial reactions in the exchange rate and long-term interest rates to an adverse shift in expectations about entry date *T*.

One specific feature implicitly assumed about the monetary transmission mechanism is that the exchange rate channel dominates the transmission and the role of the interest rate channel is negligible. A number of stylised facts (e.g. the leverage and currency composition of debt in the corporate sector, interest sensitivity of household consumption, high degree of openness, etc.) point to this direction in Hungary. This assumption is in accordance with those applied in the inflation forecast model of the MNB, in which the interest rate channel is suppressed.[6]

The changes in the variables in question depend strongly on what monetary policy reaction is expected by market participants after the shift in expectations. Since the Maastricht criterion on inflation must be fulfilled only x years later in this case, the central bank may choose to stick to the original target inflation path but it may as well modify it according to the new circumstances. Based on this, we can distinguish between a 'conservative' and an 'adaptive' monetary policy reaction.

'Conservative' monetary policy

According to the estimations presented earlier, the cumulated risk premia increases by 250-350 basispoints for each year by which eurozone entry is postponed. If monetary policy is perceived to be 'conservative', in the sense that markets do not think that the inflation target path will be altered, then they will also expect the central bank to increase short interest rates in the future to fully offset the increase in future risk premia. This way the central bank defends the exchange rate path necessary for the inflation path. According to the earlier calculations, this means that short-term interest rates are

[5] *Benczúr* (2003) uses a small open economy macro model to trace out the path of these variables as a response to shocks in expectations/regime switches.

[6] For more information on the MNB's inflation forecasting model and a comparison with other accession country's models see *Hornok* and *Jakab* (2002).

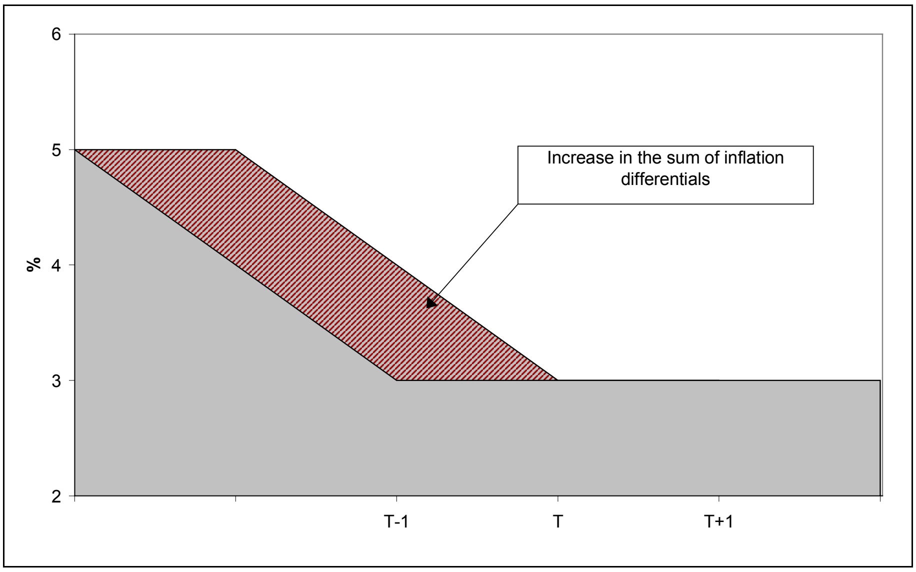
250-350 basispoints higher for each year from *T* to *T'*. In this 'conservative' case the spot exchange rate remains unchanged. However, as there is an increase in expected future short-term interest rates, spot long-term interest rates will rise. According to the expectations hypothesis of the term structure, long-term interest rates are an average of expected future short-term rates. Therefore, spot ten-year yields increase by roughly 25-35 basispoints for each year by which the expected entry is postponed.

'Adaptive' monetary policy

On the other hand, market participants may think that together with the shift in the entry date to *T'*, the target inflation path will be adjusted as well to meet the Maastricht criterion only at a later date, consistent with entry in *T'*. In this 'adaptive' case, beside cumulated risk premia, the sum of expected inflation differentials increases as well. Assuming a delayed disinflation path, the increase in the cumulated inflation differentials equals the area of the dark shaded parallelogram in Chart 5. It is important to note that this area is the bigger the larger the gap between current inflation and the Maastricht-satisfying level and the further away the entry date is postponed.[7]

[7] *Chart 5* plots the annual inflation for Hungary but the difference between the two inflation paths would be the same if we plotted the variable $\tilde{\pi}_i$, as we would only have to deduct *b* from both paths in that case. Similarly, the difference between the two paths would not change if we plotted the inflation differentials vis-à-vis the eurozone.

Chart 5.: Stylised inflation paths in the 'adaptive' monetary policy case



The chart is based on the assumption that entering the eurozone in period *T* requires that the inflation criterion be fulfilled one year earlier. The chart shows that a one-year postponement of the entry date results in a 1*(5-3) = 2 percentage point (the area of the parallelogram) rise in the cumulated inflation differentials, given an initial inflation of 5% and a Maastricht inflation criterion of approximately 3%.

How this is divided between a depreciation of the spot exchange rate and an increase in the spot (or expected future) short interest rates cannot be seen from (12) alone. Since the sketched disinflation path determines the necessary path of the exchange rate – because we assumed that the role of the interest rate channel is insignificant – the size of the depreciation of the spot exchange rate depends on the speed of the pass-through. The increase in inflation is low at the beginning of the modified inflation path and is at its maximum between the start of the delayed disinflation and period *T-1*. If the pass-through is fast, the more sizeable depreciation will take place only slightly before the start of the delayed disinflation, i.e. in the future. However, if the pass-through is slow, a significant depreciation is possible at present.

In summary, the method presented here predicts that a one-year shift in the expected entry date leads to an approximately 25-35 basispoint rise in ten-year spot yields and no change in the spot exchange rate in the case of 'conservative' monetary policy. On the other hand, if monetary policy is perceived to be 'adaptive', a further 200 basispoints are divided between the depreciation of the spot exchange rate and the rise of future short-term yields. This means that ten-year yields may increase by a another 20 basispoints or the spot exchange rate may depreciate by as much as 2%. The quicker the pass-through the more delayed the reaction of the exchange rate may be.

These magnitudes look small at first glance, but they may get rather large if the eurozone entry date is shifted out by more than one years. Such a situation might emerge quite easily. If, for example, the trigger for the shift in expectations is a collapse in the credibility of fiscal convergence, the new expected entry date may well be more than a year away from the previous one. In the markets' view, the lack of fiscal discipline may signal that the incumbent government does not want to face the costs of complying with Maastricht in the current political cycle. The new expected entry date in this case can easily be shifted to the middle of the new cycle, that is, by as much as three years. Simply multiplying our results for a one-year shift would show that ten-year yields in this case may increase by 75-105 basispoints in the conservative case and the spot exchange rate in the worst case may depreciate by 6%.

All these calculations assumed that the new entry date is fully credible. It is possible, though, that a disappointment in the convergence programme would create a general uncertainty about the willingness of the government to join the eurozone. In this case, the consequences for exchange rates and interest rates can be more severe than the ones presented here.

II. Market expectations about the entry date

Information on the markets' view about the most likely eurozone entry date is available both directly and indirectly. Direct evidence is offered by regular polls conducted by Reuters.[8] It is possible, however, to gauge these expectations indirectly, making use of information in the price of financial market instruments. One way to do so is to compare implied forward interest rates derived from zero-coupon yield curves in Hungary and in the eurozone. This approach makes use of the fact that after adopting the euro, Hungarian nominal interest rates will differ from eurozone nominal rates by only a

[8] Reuters publishes these surveys every month since January, 2003, in which 10-15 macroeconomic analysts are asked about their expectations regarding Hungary's eurozone entry date. In addition, Reuters published two surveys covering the whole Central European region polling 35-40 analysts in August and November.

small default risk premium. Since implied forward rates are indicative of the markets' expectation of future short interest rates, the observed differential of one-year implied forwards in, say, 2009 depends on the probability the market attaches to scenarios in which Hungary is already a full member of the EMU by that year. The higher this probability, the lower is the implied forward differential for that particular year. Formally, $FS_{t,T}$, the observed one-year forward interest differential for year *T*, observed in *t* can be decomposed as the following:

$$FS_{t,T} = (1 - Prob_t(GMU_T)) * Spread_T^{Non-GMU} + Prob_t(GMU_T) * Spread_T^{GMU} \quad (13)$$

where $Prob_t(GMU_T)$ is the probability at time *t* that the market attaches to scenarios in which Hungary is a full member of EMU by year *T*, $Spread_T^{Non-GMU}$ is the expected interest rate differential if Hungary *is not* in the eurozone by year *T,* while $Spread_T^{GMU}$ is the expected interest rate differential once Hungary is in the eurozone, i.e. the expected default risk premium. Because of the currency risk, $Spread_T^{Non-GMU}$ is obviously greater than $Spread_T^{GMU}$.

From (13), the implied probability of Hungary being a eurozone member by year *T*:

$$Prob_t(GMU_T) = \frac{Spread_T^{Non-GMU} - FS_{t,T}}{Spread_T^{Non-GMU} - Spread_T^{GMU}} \quad (14)$$

$FS_{t,T}$ can be calculated from HUF and EUR zero coupon curves. For the other two determinants of $Prob_t(GMU_T)$ one has to make assumptions. Euro-denominated Hungarian sovereign bonds currently trade around 35-40 basispoints above euro swaps, that is the default risk premium is already quite close to levels observable within the eurozone. We assumed some further convergence, as credit risk probably improves with adherence to the Stability and Growth Pact, resulting in a 20 basispoint value for $Spread_T^{GMU}$.

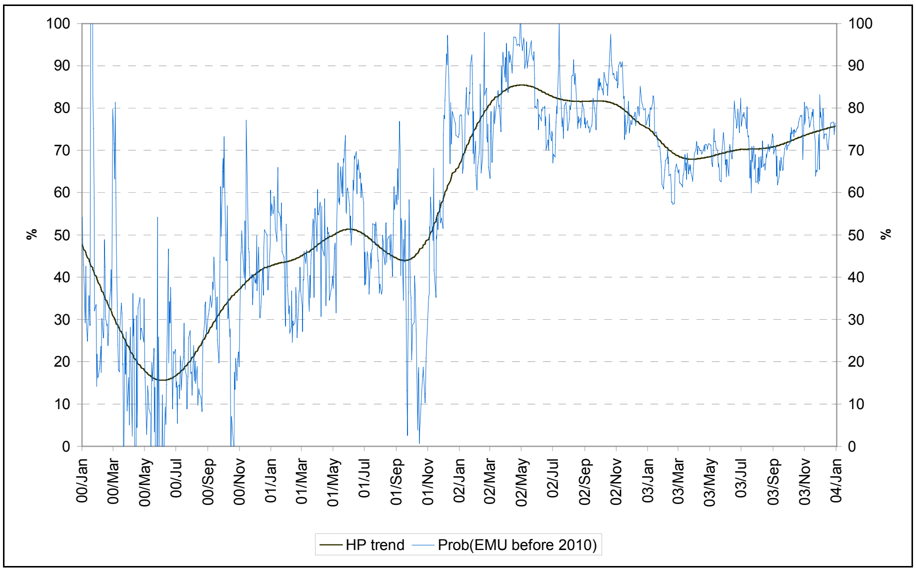
More problematic is the choice of $Spread_T^{NoN-GMU}$, that is the expected future interest rate differential if Hungary stayed out of the eurozone. Interest rate differentials are expected to decline from current levels for a number of reasons. First, with EU-membership, Hungary will be better able to differentiate itself as a 'converging' economy and may get more insulated from financial contagion coming from emerging markets. The result of this will be a decline in the currency risk premium and a shrinking of the interest rate differential. Second, the exchange rate stability required during the run-up to full EMU membership can have a similar effect. Third, domestic interest rates may decrease as a result of progress in disinflation.

So, how to get an estimate for the expected interest differential in the post-EU-accession, pre-EMU-entry period? Observed implied forward differentials could be a help here, but clearly, at least beyond a given horizon, the possibility of eurozone membership is discounted into them as shown in (13). However, if one chooses a future year in which Hungary is already an EU-member but the probability of full EMU-membership is technically zero, the observed implied forward differential on this horizon is probably a good approximation of the interest rate differential expected to prevail in the period between EU and eurozone entry. A suitable year to choose is 2005, by which Hungary is already an EU member state but some Maastricht criteria, especially the two-year ERM II membership, is impossible to meet by that time. In the calculations for the daily implied probabilities, we used the value of the 2005 one-year implied forward differential observed on the same day for an estimate of $Spread_T^{NoN-GMU}$.

The one-year implied forward differential for 2005 averaged 280 basispoints from 2002 until early November, 2003. As the forward differentials for 2005 showed very strong daily volatility, we smoothed the time series with the Hodrick-Prescott filter. One has to bear in mind, though, that Hungary's EU membership for 2005 was not obvious in the earlier years – say before 2002 – and therefore the early estimates must be treated with caution.

To get a picture of the evolution of market expectations, we first plotted $\Pr ob_t(GMU_{2009})$, i.e. the implied probability of Hungary entering the eurozone before 2010. As the graph shows, the early eurozone entry scenario had a relatively low probability (below 50%) until the last quarter of 2001, when it started to increase steadily. The probability was around 80% throughout 2002 and stabilised around 70% in 2003.

Chart 6: Implied probability of Hungary entering the eurozone before 2010



To translate the implied probabilities into an expected entry date, we weighted each year from 2006 to 2010 with the corresponding incremental implied probabilities and chose 2013 as the 'terminal' date for entry, receiving all the residual probability (i.e. that of entering after 2010). We calibrated the 'terminal' date so that our results are in line with the results of the Reuters polls. It must be stressed here that one cannot plausibly attribute extreme dates (e.g. beyond 2020) for the 'terminal' entry date, since Hungary does not have an opt-out from becoming a full member of EMU. Note that since the second quarter of 2002 the residual probability has reduced to 20-30%, therefore the calculated expected entry dates after this point are not very sensitive to the choice of the 'terminal' entry date, as far as it is in a reasonable range.[9] Before 2002Q2, however, the residual probability was much higher meaning that the implied entry dates are much

[9] As to the sensitivity of this date to the choice of the 'terminal date', choosing the latter to be 2014 instead of 2013 would shift out the estimated entry date only by 2-3 months for the observations in the last two years of our sample.

more sensitive to the choice of the 'terminal' date for this period. This is another reason why these results should be treated with caution.

Chart 7: Implied eurozone entry dates for Hungary

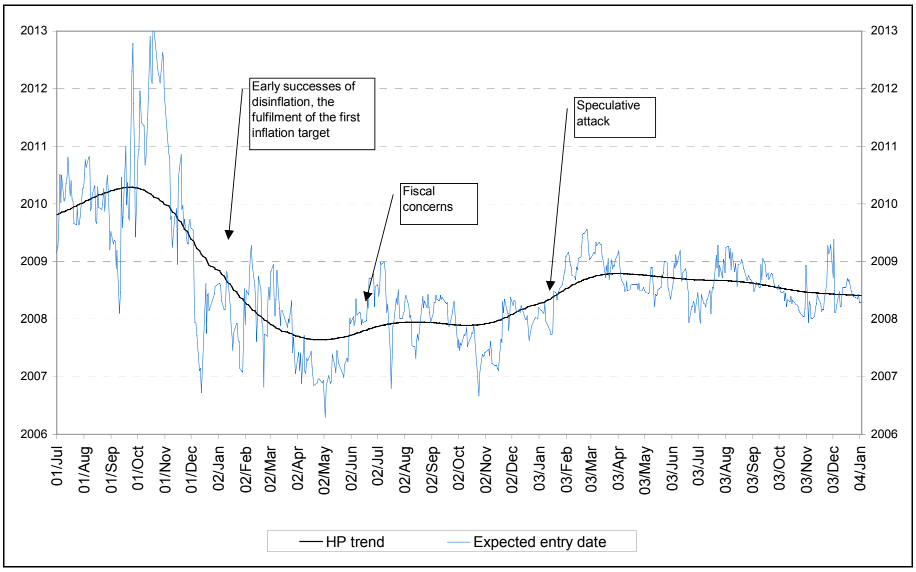


Chart 7 tells a similar story as the previous one with the implied probabilities, but now we have estimates of the expected entry date. Due to the uncertainty about the early estimates, the graph only shows the observations after July, 2001. In the last months of 2001, the expected entry date started to decline rapidly from the previously high levels. The issue of the timing of Hungary's eurozone entry started to get attention in public debate around the middle of 2001. That was the time when the central bank introduced an inflation targeting regime and argued that the path of inflation targets should be set so that they allow the earliest possible (meaning, at that time, 2006 or 2007) eurozone entry. Inflation dropped significantly in the last quarter of 2001, safely below the first year-end target set by the MNB. Although this was only partly attributable to the new monetary regime, it may have convinced market participants that the early euro agenda can be taken seriously.

The optimism of markets reached its peak in the first half of 2002 with an expected entry date below 2008. In May, 2002 this favourable trend turned around and in the following months the trend of expected dates shifted out by half a year. This was the time when doubts about the sustainability of fiscal trends arose, which presumably created concern among foreign bond investors. Since the end of 2002, the trend of expected entry dates shifted out by three-quarters of a year and stabilised between 2008 and 2009. This indicates that markets are critical towards the target date of 1 January, 2008 announced jointly by the government and the MNB, but the expected delay is below one year.

We note that the calculated time series of the implied entry dates does not capture the short-run impact of certain episodes of recent times. One such episode was the successful Irish referendum on the Nice Treaty in October, 2002. Though the calculated entry dates showed a rapid fall for a short period of time, suddenly they started rising again reaching even higher levels than before the referendum. Similarly, the impact of the devaluation of the forint's intervention band in June, 2003 on the calculated entry dates was not what one might have expected: though the immediate impact was a strong rise for a few days but this was followed by a much more drastic fall. Nonetheless, the smoothed trend line was moving in line with the changes in the macroeconomic environment in the long run, and thus our method is probably a good approximation of the long-term developments of market expectations.

III. Changes in entry-date expectations and their consequences in the past

It is interesting to compare the changes of the expected entry date, the exchange rate and yields in recent times with the responses predicted by our method. Because of the problems regarding the early estimates of the expected date, we only examine the past two years. There have been two distinct periods in the development of the expectations throughout the past two years: between October, 2001 and April, 2002 the entry date expectations fell strongly, and between October, 2002 and September, 2003 they shifted out.

Between October, 2001 and April, 2002 the calculated expected entry dates showed a roughly 3-year decline (Chart 7). At the same time, the nominal exchange rate of the forint appreciated by some 5% and the difference between 10-year interest rates of Hungary and the eurozone fell by 130 basispoints.

Our method predicts that the fall in the future currency risk premia caused by the change in expectations reduces the 10-year interest differential by 75-105 basispoints. We have to take into account, however, that the initial level of inflation is not 5% in this case. It is also important that our method calculated with a sudden change in expectations, i.e. within one time period. On the other hand, here we are examining a period lasting several months; therefore we do not take one concrete value of inflation but rather a range. Between October, 2001 and April, 2002 CPI inflation was moving in an interval of 6-7.5%. The central bank was probably viewed as 'adaptive', i.e. it was expected to set ambitious inflation targets to facilitate the quick eurozone entry the markets had just started to believe in. Based on this, the area of the parallelogram – because of the 3-year fall in the expected date and the higher initial inflation – is between 3*3 = 9 and 4.5*3 = 13.5 percentage points. This change in cumulated inflation is divided between the spot exchange rate and long-term yields as suggested by (12). The exchange rate appreciated by 5% in the examined period so there would be 40-85 basispoints left for a fall in the ten-year yields. Interestingly, this is in line with the 130 basispoint fall in the actual interest rates since we explained 75-105 basispoints with the currency risk premia.

In contrast, the expected entry date shifted out by approximately three-quarters of a year between October, 2002 and September, 2003. The exchange rate of the forint weakened by approximately 4% and the spot 10-year interest rate differentials grew by some 25 basispoints.

According to the predictions of our method, this shift in expectations would result in a 19-26 basispoint rise in long-term yields because of the rise in the future currency risk premia. By this time the central bank had already increased its inflation targets a number of times so it was most probably viewed as behaving 'adaptively'. For the calculation of the inflation differentials we used a starting range of 4-4.5%, in which inflation was moving in the examined period. Thus the area of the parallelogram is between 1*0.75 = 0.75 and 1.5*0.75 = 1.1 percentage points. This is much less than the actual change of the exchange rate.

We emphasise, however, that entry date expectations are not the only factors that influence current monetary conditions, and this can lead to situations where monetary conditions do not move in accordance with the predictions of our method. For instance in the last quarter of 2003, the forint experienced a considerable depreciation, long-term yields rose, while the estimated entry date expectations did not show a clear rising trend. One possible explanation for this could be that markets did not revise the expected entry date in that period, but rather the expected ‘equilibrium’ exchange rate at which Hungary would be able to enter the eurozone at *T*. Indeed, since the last quarter of 2003, the sustainability of Hungary’s external deficit and the issue of where the ‘equilibrium’ exchange rate may be, attracted a lot of market attention. Following (10), such a revision of the ‘equilibrium’ real exchange rate at which the country may enter the eurozone also implies that the spot exchange rate depreciates.

In summary, the ex post analysis based on historical data showed several instances when a change in the expected entry date coincided with changes in monetary conditions in line with the predictions of our method. However, even in these cases our model did not always capture the magnitude of the response of the exchange rate completely, for which there may be several reasons. First, there may be revisions in the ‘equilibrium’ real exchange rate at which the country is expected to enter the eurozone. Second, our model assumes that a delay in the expected entry increases the currency risk premia only after period *T*, but in reality it probably affects the earlier premia as well. Thus the cumulated premia may change more and the yields and the exchange rate may react more strongly than predicted by our method.

IV. Conclusion

In 2003, financial markets were pricing in an early (2008-09) eurozone entry for Hungary. However, if the convergence process gets derailed for some reason, an adverse revision of entry date expectations may take place. Because of the forward-looking nature of financial markets, such a postponement of the expected entry date will immediately be reflected in long-term yields and the spot exchange rate. The assessment presented in this paper showed that a serious (three-year) outward shift in the entry date would inevitably result in the increase of long-term yields. If, the central bank is perceived to behave ‘adaptively’, i.e. as a result of the more distant entry date the target inflation target path becomes less credible, there may be pressure for a sizeable depreciation as well. The further away current inflation is from the Maastricht-satisfying level, the bigger the size of this depreciation can be. In such a situation, if the country is already in ERM II, meeting the exchange rate stability criterion may become jeopardised. This way, the shift in expectations about the entry date may turn out to be self-fulfilling.

Therefore, the tentative conclusion from this analysis is that Hungary should not push for ERM II participation as long as (a) fiscal convergence is not safely on track and (b) the credibility of the medium-term inflation target path is not sound and (c) inflation is relatively high above the level consistent with the Maastricht criterion. If any of these conditions change for the better, a revision of entry date expectations is less likely or has a more limited impact on the exchange rate. In this case, the risks of breaching the exchange rate stability criterion within ERM II become more contained.

One limitation of the conclusion presented here is that it does not consider the potential stabilising effect, which the ERM II-membership itself may have on entry date expectations. Further research into this question is obviously necessary.

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