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

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Hungary's eurozone entry date: what do the markets think and what if they change their minds?
(Az euro bevezetésének időpontja: a piaci várakozások hatása a forint árfolyamára és az állampapír-piaci hozamokra)
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Abstract

This article investigates the potential impact of a shift in market expectations about a country's eurozone entry date on long-term yields and the spot exchange rate in a simple uncovered interest parity (UIP) framework. The results suggest that the size of the reactions depend on how far the entry date is postponed, how far current inflation is from the Maastricht-satisfying level, and whether the credibility of the central bank's target inflation path is sensitive to changes in the expected entry date. In the empirical part, the authors apply the framework for Hungary and draw some policy conclusions for the timing of ERM II entry.
(JEL E42, E52, F33, F42)

Abbreviations

ERM II: Exchange Rate Mechanism II
EU: European Union
MNB: Magyar Nemzeti Bank (the central bank of Hungary)
UIP: Uncovered Interest Parity

Összefoglalás

A tanulmány Magyarország eurozóna-csatlakozására vonatkozó pénzpiaci várakozások megváltozásának lehetséges hatását vizsgálja az azonnali árfolyamra és a hosszú lejáratú állampapír-piaci hozamokra egy egyszerű fedezetlen kamatparitáson alapuló keretben. Az eredmények szerint a hatás nagysága függ attól, hogy milyen messzire tolódik az euro bevezetésének időpontja, milyen messze van az aktuális infláció a maastrichti inflációs kritériumtól, és attól, hogy a jegybank által célzott inflációs pálya hitelessége függ-e a várt eurobevezetési dátumtól. A tanulmány empirikus részében a szerzők Magyarország esetére alkalmazzák az elemzési keretet, és következtetéseket vonnak le az európai árfolyam mechanizmushoz (ERM-II) történő csatlakozás időzítését illetően.

1. Introduction

In the middle of 2004, ten countries – most of them from the Central and East European region – joined the European Union (EU). All of the new member states are required to adopt the euro in the future. Before introducing the euro, however, these countries must fulfill the so-called Maastricht convergence criteria, but there is no explicitly defined deadline for this. Financial markets form their own view about the future date of entry to the eurozone of these countries. If a change in the circumstances persuades markets that the convergence process will be delayed, 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. Issing (2005) also notes that changes in these expectations can result in sharp reversals in capital flows which expose the exchange rate to large swings.

There is a large body of literature analyzing how financial markets assess the outlook of EU members of adopting the single currency in the future (see Bates, 1999 for a review of this literature). This paper adds an important insight to the existing work: it presents a simple framework which quantifies the potential size of the reaction of monetary conditions to a change in the expected entry date. In addition, the paper provides important policy conclusions regarding the participation in the Exchange Rate Mechanism II (ERM II), a necessary precondition to entering the eurozone.

The paper applies the method for the case of Hungary. From the ten new EU members, Hungary presents an especially interesting and unique example as financial markets' expectations about the country's eurozone prospects have shown remarkable dynamics in recent years. Starting from rather optimistic expectations in 2001 and showing further improvement until mid-2002, the prospects have deteriorated markedly by the end of 2004. Therefore the country presents an interesting example for studying the impact of this dynamics on monetary conditions.

The article is organized as follows. Section 2 provides an assessment of the markets' view on Hungary's eurozone entry date using information from forint and euro yield curves. Section 3 describes a simple method which quantifies the potential impact of an adverse shift in the expected entry date on the spot exchange rate and long-term interest rates. Section 4 gives an illustration of the reactions of monetary conditions implied by the method and presents an ex post comparison of changes in the exchange rate and long-term yields with the changes predicted by the method presented in this article. Section 5 concludes with important policy implications for ERM II entry.

2. Market expectations about the entry date

2.1. Deriving expected entry dates from yield curves and surveys

Information on the markets' expectation about Hungary's eurozone entry date is available both directly and indirectly. Direct evidence is offered by regular polls of local financial market analysts conducted by Reuters.[1] However, since these surveys started in 2003, they provide a rather limited time-span for analysis.

It is also possible to gauge entry date expectations indirectly, making use of information in the price of financial market instruments. According to Bates (1999), the basis of these analyses can be Arrow-Debreu type contracts, currency options and yield curves. Arrow-Debreu contracts for the eurozone entry of Hungary are not available, and the time horizon of currency options for which there is enough data is not long enough for this purpose. Therefore the analysis is based on the information from the term structure of Hungarian yields.

The basis of the yield curve method 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 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 eurozone 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:

[1] Reuters publishes monthly surveys since January, 2003, in which 10-15 macroeconomic analysts are asked about their expectations regarding Hungary's eurozone entry date. In addition, Reuters publishes quarterly surveys covering the whole Central European region polling 35-40 analysts. As of May, 2004, only the regional polls provide information about the expected eurozone entry date.

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

where $Prob_t(EMU_T)$ is the probability at time *t* that the market attaches to scenarios in which Hungary is a full member of eurozone by year *T*, $Spread_T^{Non-EMU}$ is the expected interest rate differential if Hungary *is not* in the eurozone by year *T*, while $Spread_T^{EMU}$ is the expected interest rate differential once Hungary is in the eurozone, i.e. the expected default risk premium. Because of the currency risk, $Spread_T^{Non-EMU}$ obviously greater than $Spread_T^{EMU}$.
From (1), the implied probability of Hungary being a eurozone member by year *T*:

$$Prob_t(EMU_T) = \frac{Spread_T^{Non-EMU} - FS_{t,T}}{Spread_T^{Non-EMU} - Spread_T^{EMU}} \quad (2)$$

$FS_{t,T}$ can be calculated from forint and euro zero coupon curves. For the other two determinants of $Prob_t(EMU_T)$ one has to make assumptions. Euro-denominated Hungarian sovereign bonds currently trade around 20 basis points above euro swaps, that is the default risk premium is already quite close to levels observable within the eurozone. Therefore the authors assume a 20 basis point value for $Spread_T^{EMU}$.
More problematic is the choice of $Spread_T^{Non-EMU}$, 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 eurozone membership can have a similar effect. Third, domestic interest rates may decrease as a result of progress in disinflation.
There are several approaches in the literature to approximate the value of $Spread_T^{Non-EMU}$. De Grauwe (1996) makes use of historical average of spreads, a J.P. Morgan study (1997) uses international measures of risk, Favero et al. (1997) estimate a central bank reaction function and Lund (1998) builds a model for the term structure. For reasons of simplicity, this article uses historical averages of implied forward differentials.

These differentials can be useful in approximating $Spread_T^{Non-EMU}$, but beyond a given horizon, the possibility of eurozone membership is discounted into them as shown in (1). Therefore, one should choose a future year in which Hungary is already an EU-member but the probability of full eurozone membership is technically zero. For instance, the year 2005 satisfies these conditions. Between the middle of 2001 and the middle of 2004, the average of one-year implied forward differentials for 2005 was around 430 basis points. Accordingly, the authors use a fixed value of 450 basis points for an estimate of $Spread_T^{Non-EMU}$. However, the fact that forward differentials exhibited significant volatility around this historical average (see *Figure 1*) points to the limitations of such an approach and suggests that any results should be interpreted with considerable caution.

To translate the implied probabilities into an implied entry date, the authors weight each year from 2007 to 2013 with the corresponding incremental implied probabilities and choose 2014 as the 'terminal' date for entry, receiving all the residual probability (i.e. that of entering after 2013). 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 the eurozone. As to the sensitivity of the results to the terminal date: choosing 2015 would shift the results out by around 3 months.

Figure 2 shows the Hodrick-Prescott trend of daily implied entry dates from July, 2001 onwards. Technically, it is possible to calculate implied entry dates for earlier periods as well, but their interpretation would be problematic. The reason for this is that prior to mid-2001, there was hardly any public debate on eurozone entry, so one can plausibly assume that entry date expectations were probably not even formed before this period. This is also reflected in the fact that it was only in January 2003, that Reuters had started conducting surveys among local macro-analysts on the expected eurozone entry date. The average expected entry dates from these surveys are also included in *Figure 2*.

As it is clear from *Figure 2*, both the yield-curve and the survey-based expected eurozone entry dates showed a clear increasing trend from January, 2003. However, the latter curve is considerably flatter than the estimates based on yield curves. In early

2003 the two curves were close to each other, but at the end of the sample the difference between them reached 1.5 years.

There are several factors which can explain the significantly higher entry dates calculated from yield curves. A straightforward explanation is that the expectations concerning $Spread_T^{Non-EMU}$ for the future years increased during 2003. One explanation for this could be a worsening of economic fundamentals.[2] Indeed, from the second half of 2003, markets started to become more and more concerned with the widening of the current account deficit, which at the end of the year resulted in some market turbulence. This may have been reflected not only in higher short term interest rates, but also in an increase in $Spread_T^{Non-EMU}$, i.e. the expected future interest rate premium over the eurozone interest rates in the case that Hungary does not join the eurozone. If this is the case, equation (1) implies that the estimates of the expected entry dates from yield curves are biased upwards in the second half of the sample since the authors calculated with a fixed value for this premium.

Another possible explanation is that analysts, when asked about the entry date, give the most probable value, i.e. the mode of their subjective probability distribution about the entry date. However, when pricing financial assets such as long-term bonds, market participants take into account less probable alternative scenarios as well, therefore bond prices reflect the expected value of the same subjective probability distribution instead of the mode. If the distribution in the market's view is strongly skewed towards a later entry date – meaning that there is a much higher probability of a large increase than a large fall in the expected entry date – the expected value is greater than the mode. As a result, yield curve-based methods may give a later expected entry date than survey-based methods.

It may be argued that the skewness of the market's probability distribution increased from 2003 onwards and thus the difference between expected entry dates from the two information sources also widened. Because of the several instances of missed fiscal targets and the growing uncertainty regarding the future of fiscal consolidation, the role of official target dates in guiding market expectations was probably

[2] See Favero et al. (1997) for a treatment of the role of the fundamentals in calculating the probability of joining the eurozone.

declining continuously. In practice this implies that while the mode of the market's subjective probability distribution may have stayed close to the official target date, the skewness towards a later entry date may have increased.

As both explanations seem appropriate, one cannot say that either of the methods clearly dominates the other in terms of reliability. While the yield curve method may have some upward bias in the second half of the sample, the Reuters polls may be underestimating the expected value of the entry dates. Thus, the expected entry date of the market may be somewhere between the values suggested by the two methods.

2.2. The evolution of entry date expectations in 2001-2004

In the last months of 2001, the implied 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 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. The successful disinflation was important for Hungary's eurozone prospects, because until the middle of 2002, it seemed that the only Maastricht criterion that would pose a major challenge for Hungary was inflation. However, this situation changed during the year 2002 because of the rapidly worsening fiscal outlook. In 2002, the fiscal deficit exceeded 9% of GDP, far above the Maastricht criterion of 3%. In the next two years, the prolonged uncertainties about the fiscal consolidation necessary for complying with the Maastricht criteria have resulted in a steady increase in the expected entry date. This is reflected in the increasing HP-trend of implied entry dates from the middle of 2002 in *Figure 2*.

Against this background, setting official target dates did not help either. In August 2003, the government announced 2008 as the official target date, but the slowness of the fiscal consolidation cast some doubt over the credibility of this target already at the time of the announcement. Markets did not believe in the target date from the very beginning, as it was clear from either survey evidence or the yield-curve based method, both showing entry dates later than 2008. The announcement slowed down the continuous postponement of the expected entry date, but only temporarily. The government's commitment proved to be short-lived. In the beginning of 2004, shortly after it became known that the fiscal target for 2003 was missed by a large margin, the government increased its target date to 2009-2010. Market expectations about the entry date followed suit, showing a 2010-2011 date by mid-2004.

3. Potential consequences of an adverse shift in market expectations

When analyzing the impact of entry date expectations on monetary conditions, the article focuses on two factors: future currency risk premia and inflation. More precisely, the authors aim 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-augmented version of the UIP condition.

As shown in the Appendix, the impact of a revision of entry date expectations on the spot exchange rate can be written as:

$$s_t' - s_t = E_t\left[(\tilde{q}_{T+1} - \tilde{q}_T) - \sum_{\tau=t}^{T-1}(i_\tau' - i_\tau) + \sum_{\tau=t}^{T-1}(\rho_\tau' - \rho_\tau) + \sum_{\tau=t+1}^{T}(\tilde{\pi}_\tau' - \tilde{\pi}_\tau) - i_T' + \rho_T' + \tilde{\pi}_{T+1}'\right] \quad (3)$$

where s_t denotes the nominal exchange rate, q_t the real exchange rate, i_t the interest rate, ρ_t the risk premium and π_t the inflation rate. The variables s_t', i_t', ρ_t' and π_t' denote variables following a one-period shift in the expected entry date. $\tilde{q}_T$ and $\tilde{\pi}_\tau$ are variables purged of the long-run trend appreciation of the real exchange rate (see Appendix for more details).

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.[3] In this case, if expectations about T are shifted out by one year, the reaction of the spot exchange rate depends on how the cumulated short interest rate differentials, risk premia and inflation differentials change as they are summed over a period one year longer than before.

[3] Note that the trend appreciation is filtered out from $\tilde{q}_T$; see the Appendix. Though in this paper the authors assume that the rate of the trend appreciation (b) is constant in time, the results would not change if b was allowed to diminish gradually in time, which would be perhaps more in line with the intuition. This is because the b parameters in any given period would still cancel out.

To be able to derive the exact new paths of s_t, i_t and π_t, (3) 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 article.[4] The goal of the authors here is 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*. With the help of some plausible assumptions about the Hungarian transmission mechanism and the central bank's behavior, this can be done without a formal calibrated model.

One specific feature assumed about the monetary transmission mechanism is that the exchange rate channel dominates the transmission and the direct role of the interest rate channel is negligible. A number of stylized 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.[5] In such a set-up, the target inflation path determines what exchange rate path the central bank is currently aiming at and interest rate policy is used only to facilitate that path by offsetting any changes in risk premia, without having a direct effect on inflation. This means that in (3), any change in the inflation target path or the path of risk premia as a reaction to a delay in eurozone entry will mechanically determine the path of short-term central bank interest rates. Therefore, what is of interest here is the likely reaction of the path of risk premia and the target inflation path to a delay in the expected eurozone entry date.

3.1. The credibility of the inflation target path

The impact of a delay in eurozone entry on monetary conditions depends strongly on what monetary policy reaction market participants expect after the shift in expectations. Since after an x-year shift, the Maastricht criterion on inflation must be fulfilled only *x*

[4] 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.

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

years later, 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. Along this line, one can distinguish between a 'conservative' and an 'adaptive' monetary policy reaction.

'Conservative' monetary policy

According to (3), the cumulated future risk premia increase 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 that is required to achieve the target inflation path. 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.

'Adaptive' monetary policy

On the other hand, market participants may think that following a shift in the entry date to *T'*, the targeted path of disinflation 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 is the area of the dark shaded parallelogram in *Figure 3*. This area is equal to the difference of current inflation and the Maastricht-satisfying inflation multiplied by the shift in the expected entry date.[6] 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.

[6] Figure 3 plots the annual inflation for Hungary but the difference between the two inflation paths would be the same if one plotted the variable $\tilde{\pi}_i$, as one would only have to deduct b from both paths in that case. Similarly, the difference between the two paths would not change if one plotted the inflation differentials vis-à-vis the eurozone.

How this increase 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 (3) alone. Since the sketched disinflation path determines the necessary path of the exchange rate – because the authors 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 exchange rate 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.

4. Empirical application

4.1. Currency risk premia in the run-up to eurozone entry

The spot currency risk premium can be calculated from (4) 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 is calculated for the period since the exchange rate band of the forint was widened.

In the sample period running from mid-2001 to mid-2003, the observed risk premia ranged between 400-1200 basis points, with an average of 740 basis points. What is of interest here is how risk premia is expected to come down form the current level to zero at the time of entering the eurozone.

The stylized time profile of the currency risk premium assumed for the path to eurozone entry is sketched in *Figure 4*. Note that in the final years prior to eurozone entry, a sizeable risk premium is assumed to be still around. This reflects the fact that currency risk premia is not likely to converge to zero gradually but rather in a sudden move when the final conversion rate is announced. This is actually in line with the experience of many earlier eurozone entrant countries. In other words, there always remains a residual uncertainty until the conditions of eurozone entry are absolutely sure and this is reflected in a flattening of the assumed risk premia profile at a positive level in the years immediately prior to eurozone entry. The key question is, at what level this flattening is likely to take place.

Because of the uncertainty about the future, it is extremely difficult to estimate the size of the currency risk premium in the years immediately preceding eurozone entry. If one assumes no particular anticipated movement in the nominal exchange rate in years preceding eurozone entry, implied forward differentials for these years can be used as a proxy for future risk premia. Therefore in the baseline scenario, the authors use the same assumption for the annual currency risk premia in pre-eurozone years as for $Spread_T^{Non-EMU}$ in the previous section, that is 450 basis points. This is roughly the average of implied forward differentials for the year 2005 in the sample period running from mid-2001 to mid-2004. The assumed risk premium is similar in magnitude to the interest rate differentials of countries like Portugal, Spain, Italy and Greece a few years before their entry into the eurozone. In the years prior to the launch of the euro, short-term interest rates in these countries were 200-300 basis points higher than those in Germany (see Csajbók and Csermely, 2002).

The assumed flattening profile of risk premia suggests that 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 pre-eurozone risk premium, that is *x* times 450 basis points, as depicted in *Figure 4*.

4.2. Predicted response of monetary conditions under the baseline scenario of risk premia

In the 'conservative' case, the increase in the future risk premia will be fully offset by a rise in future short-term interest rates. 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 450/10 = 45 basis points for each year by which the expected entry is postponed. The spot exchange rate does not change in the case of 'conservative' monetary policy, regardless of the current level of inflation.

In the 'adaptive' case, if for instance one assumes an initial inflation of 5% and a Maastricht inflation criterion of approximately 3%, 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. This means that ten-year yields may increase by another 20 basis points 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.

4.3. Predicted response of monetary conditions under alternative scenarios of risk premia

Since the calibration of the framework involves making assumptions about the future evolution of risk premia, the authors also present alternative scenarios to illustrate the sensitivity of the results to this choice. The high volatility of the proxy used for future risk premia also underlines the need for this exercise. The authors choose two alternative scenarios for the risk premia: the average of implied forward differentials for the year 2005 plus and minus the standard deviation observed in the sample. Given a standard deviation of approximately 250 basis points, this implies a minimum of 200 and a maximum of 700 basis points.

In the first case, spot ten-year yields increase by 20 basis points, while in the second case by 70 basis points for each year of postponement. The choice of the risk premium only affects the predicted response of the long-term interest rates, while the response of the spot exchange rate is only influenced by the inflation differentials, as the exchange rate reacts to a shift in expectations only in the 'adaptive' case.

4.4. Eurozone entry date delays due to fiscal slippages

The estimated magnitudes of reactions in monetary conditions look small at first glance, but they may become rather large if the eurozone entry date is shifted out by more than one year. 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 next political cycle, that is, by as much as three years. This is precisely what happened in Hungary, where a continuous erosion of the credibility of the fiscal convergence program between mid 2002 and end-2004 contributed to a 3-year shift in the expected eurozone entry date during the same period. Simply multiplying the baseline results for a one-year shift by three suggests that in a situation where there is a 2% inflation differential vis-à-vis the eurozone and monetary policy is perceived to be 'adaptive', ten-year yields may increase by a minimum of 135 basis points and the spot exchange rate in the worst case may depreciate by 6%. Moreover, this is only the pure timing effect of the entry date shift and does not include any increase in risk premia or a revision of the equilibrium exchange rate due to fiscal misbehavior. These factors can easily magnify the depreciation and yield increase following an outward shift of entry date expectations. If a depreciation of this size takes place when the country is already in ERM II, meeting the exchange rate stability criterion may become jeopardized. This way, the shift in expectations about the entry date may turn out to be self-fulfilling.

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

It is interesting to compare the actual changes of the exchange rate and long-term yields in recent years with the baseline responses predicted by the model presented here. When assessing the explanatory power of entry date expectations, one should bare in mind that the model captures pure eurozone timing effects only, i.e. it does not include the effect of changing expectations of fundamentals or risk premia on long-term yields and the spot exchange rate.

Figure 5 shows the cumulated monthly changes in 10-year forint-euro yield differentials and the range of changes potentially explained by pure eurozone timing effects.[7] The lower boundary of the range represents the 'conservative' monetary policy case. The upper boundary represents the 'adaptive' monetary policy case with all the extra inflation differentials assumed to affect long-term yields alone and not the spot

[7] The eurozone timing effects were calculated using yield-curve based implied entry dates. The timing effects calculated on the basis of survey evidence (Reuters polls) showed a broadly similar range but covered only a smaller part of the sample, therefore these were not included in *Figure 5.*

exchange rate.[8] The width of the range depends on the distance of current inflation from the Maastricht-satisfying level, i.e. the size of cumulated future inflation differentials if the central bank loosens its target disinflation path as a response to an outward shift of the entry date. Since the model cannot tell how the effect of extra inflation differentials generated in the 'adaptive' case by an outward shift in the entry date are divided between an increase in long-term yields and spot depreciation, the pure timing effect of such a shift on long yields is somewhere between the two boundaries.

Figure 5 suggests that changes eurozone entry date expectations may have explained a sizable part of long-term yield movements in Hungary. Nevertheless, beside these pure timing effects there were clearly other factors at play in shaping the monthly movement of long-term yields. Yield differentials increased faster than predicted in summer 2002, when the new government's spending program first raised doubts about fiscal sustainability. Securing EU-entry in the last quarter of 2002 did not effect eurozone entry date expectations but it had lead to a drop in long-term yields. Both of these episodes may have had to do more with changes in expected future risk premia than pure entry date effects. A similar episode took place in the last quarter of 2003, with the implied eurozone entry date shifting slightly outwards, but long-term yields increasing much faster than predicted by the entry date shift. This was an episode when financial market participants became seriously concerned about the Hungarian fundamentals, primarily the sustainability of the country's mounting current account deficit. As a result, expectations about future risk premia may have increased, which could have an additional effect on long-term yields beside the outward shift in the expected entry date.

Figure 6 depicts actual exchange rate movements together with those predicted by the model. Since the model suggests that in the 'conservative' monetary policy case the timing of eurozone entry does not have an effect on the spot exchange rate, *Figure 6* contains the predicted exchange rate movement in the 'adaptive' case only. As the

[8] The inflation differentials for the 'adaptive' case are calculated by taking the difference of actual inflation from the Maastricht-level of inflation multiplied by the shift in the expected entry date. The authors emphasize that it is not necessary to assign any value for b or π_i^* in this calculation exercise. The reason is that the method requires taking the difference of two alternative future paths of $\tilde{\pi}_i$ based on *Figure 3*, and this difference does not change if one deducts b and π_i^* from both paths. One needs to quantify the Maastricht-level of inflation, though, for which the authors assume a value of 3%.

model cannot tell how the extra future inflation generated by a shift in the eurozone entry in the 'adaptive' case is divided between the increase in long-term yields and spot currency depreciation, it was assumed that the exchange rate picks up the full effect of an entry date shift. Therefore, the predicted depreciation in *Figure 6* should be viewed as an upper boundary of the pure timing effect of eurozone entry.

It is clear that the model is much weaker in predicting movements in the spot exchange rate compared to yield movements. Spectacular misses include mid-2003, when virtually unchanged expected entry dates coincided with a huge, 7% depreciation of the exchange rate. The depreciation was triggered by a minor, but completely unexpected devaluation of the central parity of the forint's +/-15% fluctuation band. Another large miss is the first quarter of 2004, when a rapid increase in the expected eurozone entry date coincided with a quick and sizeable appreciation of the currency.

These episodes suggest that entry date expectations are not the only factor that influences current monetary conditions, and this can lead to situations where monetary conditions do not move in accordance with the predictions of the model. Even the simple model presented here suggests that beside pure timing effects, long-term yields and the spot exchange rate can be affected by (i) changes in expected future risk premia, (ii) changing views on fundamentals leading to a revision of the entry-date 'equilibrium' real exchange rate, and (iii) changing perception of monetary policy type ('adaptive' vs. 'conservative').

Even the short period covered in this paper provides examples when these factors modified or outweighed the pure timing effect of Hungary's expected eurozone entry on monetary conditions.

The unexpected devaluation of central parity in mid-2003, and the market's possible reading that such moves may even be repeated in the future may have increased both current and expected future risk premia. Although the devaluation was initiated by the government, it required the consent of the central bank as well. Thus, such a move may have tilted the market's perception of monetary policy towards a more 'adaptive' type.

In the last quarter of 2003, the forint experienced a considerable depreciation, long-term yields rose, while the implied entry date increased only slightly and the Reuters polls actually showed constant expected entry dates. 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 (3), such a revision of the 'equilibrium' real exchange rate at which the country may enter the eurozone implies that the spot exchange rate depreciates, regardless of any change in the expected entry date. Another episode when pure timing effects did not even explain the direction of exchange rate and yield movements is the first quarter of 2004, when both the survey and the yield-curve based expected entry dates increased relatively quickly, while the currency appreciated significantly and long-term yields dropped as well. It is difficult to explain these movements with a changing perception of fundamentals since neither the fiscal outlook nor external balance showed a marked improvement in this period. However, in the same period the central bank surprised markets by keeping short-term rates high. Such a hawkish move may have changed the market's perception about the type of monetary policy from an 'adaptive' type towards a more 'conservative' type. According to the model presented in Section 2, such reclassification of central bank behavior may lead to a reversal of previous depreciations and yield increases.

5. Conclusion

In EU member states which are to join the eurozone, financial markets form their own view about the likely entry date based on a number of factors (e.g. the official target date set by the government, economic fundamentals, the credibility of the convergence process, etc). 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 article 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 targeted inflation 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 jeopardized. 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, however, 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.

The analysis of this article also highlights the importance of having a credible commitment of the central bank towards a long-run objective of price stability that is not contingent upon the convergence path. The adoption of a constant medium-term inflation target – if it is considered credible by markets – can help mitigate

the market reactions to a shift in expected eurozone entry by stabilizing longer-term inflation expectations.
One limitation of the conclusion presented here is that it does not consider the potential stabilizing effect, which the ERM II-membership itself may have on entry date expectations. Further research into this question is necessary.

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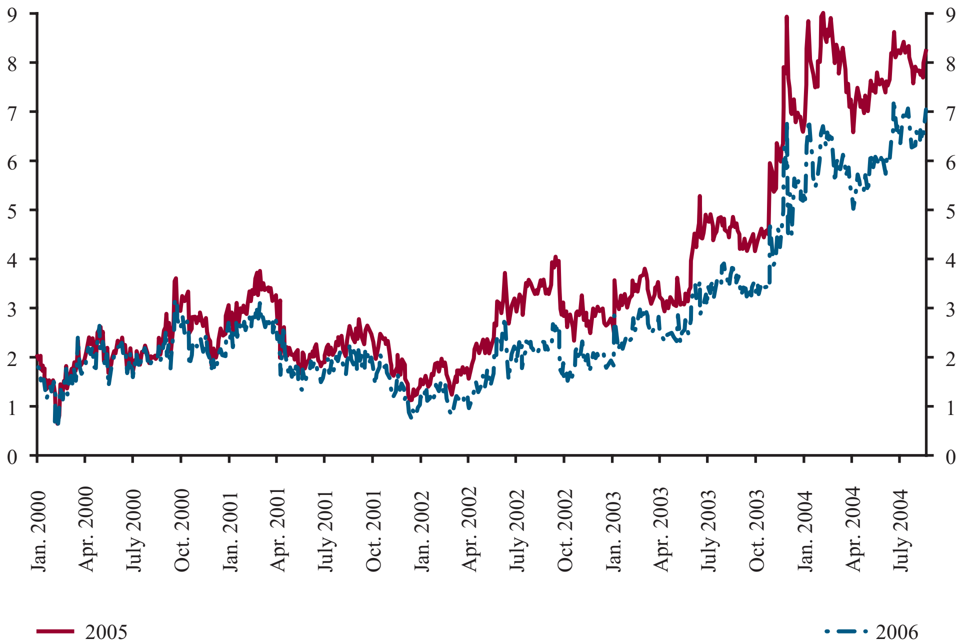
Figures

Figure 1

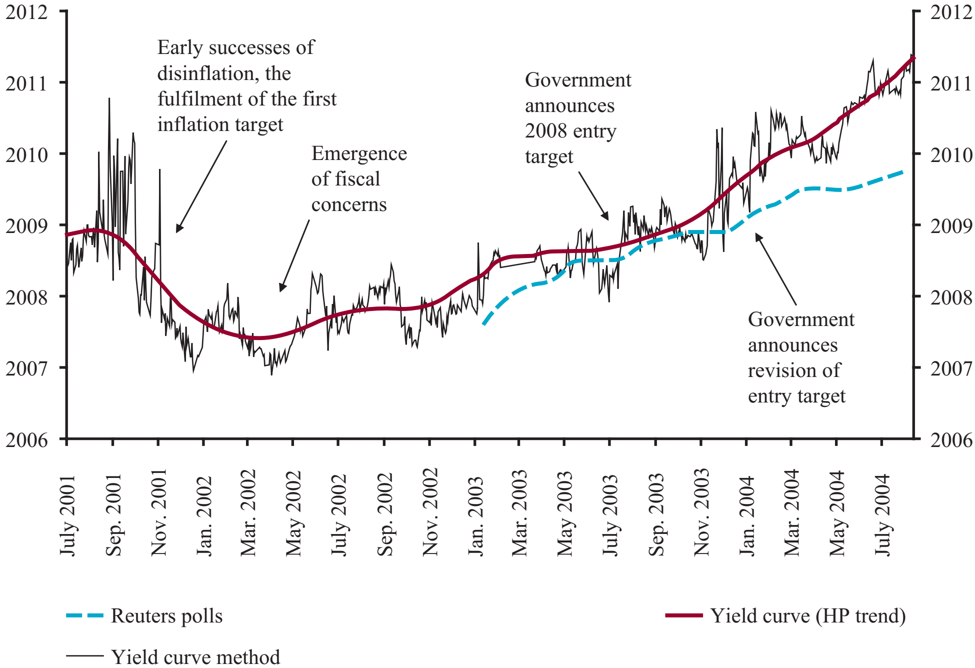
One-year forint-euro implied forward differentials for 2005 and 2006



Source: MNB.

Figure 2

Expected eurozone entry dates for Hungary



Source: Reuters, MNB.

Figure 3

Stylized inflation paths in the 'adaptive' monetary policy case

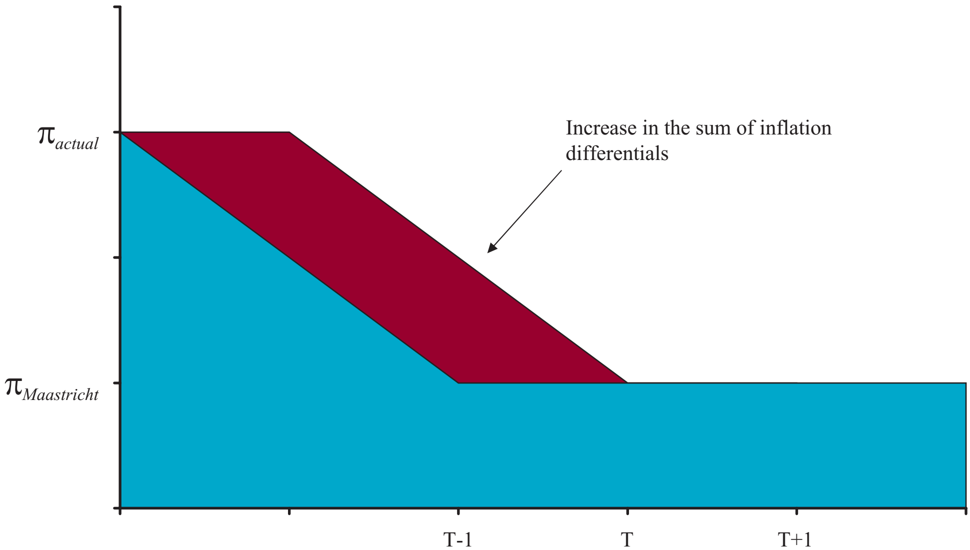


Figure 4

Stylized time-profile of currency risk premia in the run-up to the eurozone

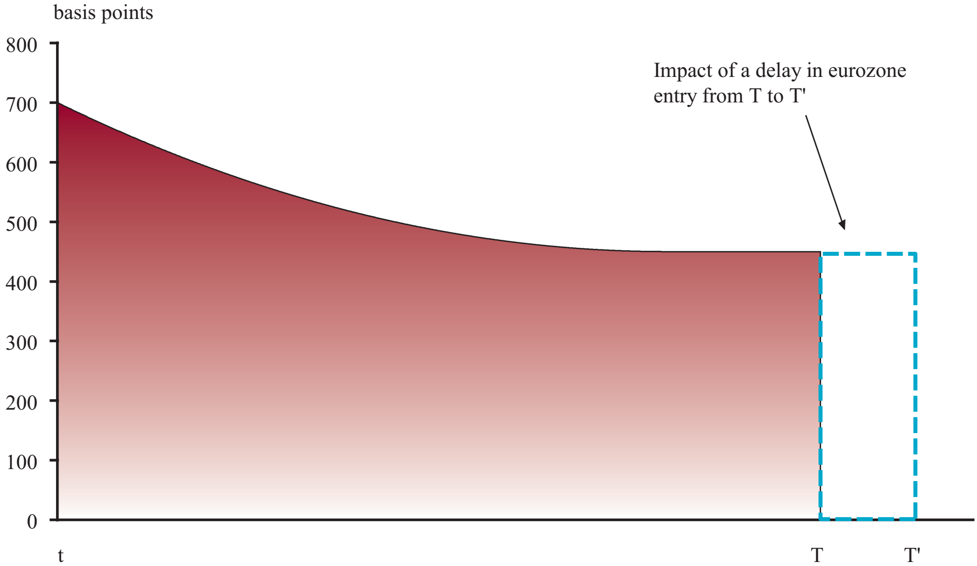
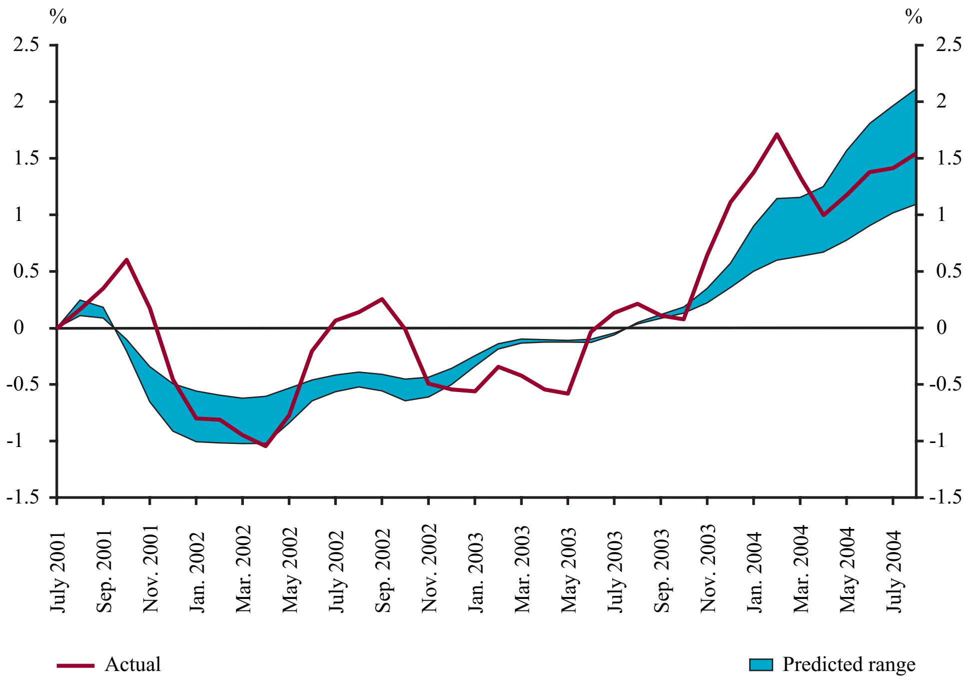


Figure 5

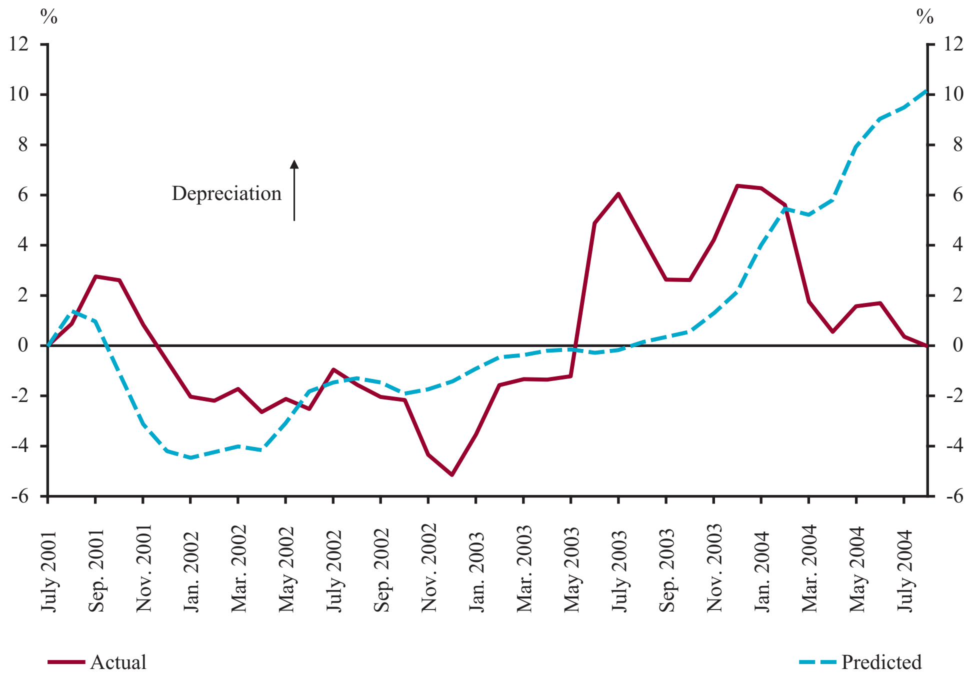
Cumulated monthly changes in the spot ten-year yield differential: actual and predicted



Source: MNB.

Figure 6

Cumulated changes in the HUF/EUR exchange rate: actual and predicted



Source: MNB.

Appendix

A simple framework for analyzing the effect of entry-date expectations on monetary conditions

According to the UIP condition (4), the differential between nominal interest rates on domestic and foreign (euro-denominated) bonds ($i_t - i^*_t$) equals the expected depreciation ($E_t(s_{t+1}) - s_t$), the currency risk premium (ρ_t) and the default risk premium.[9] 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.

$$i_t - i_t^* = E_t(s_{t+1}) - s_t + \rho_t \qquad (4)$$

By expressing s_t from (4) and iterating expectations forward up to the expected euro-zone entry date (T), one can obtain:

$$s_t = E_t\left[(s_T) - \sum_{\tau=t}^{T-1}(i_\tau - i_\tau^*) + \sum_{\tau=t}^{T-1}\rho_\tau\right] \qquad (5)$$

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 ($\pi_t - \pi_t^*$):

$$s_T = q_t + \sum_{\tau=t+1}^{T} dq_\tau + p_t - p_t^* + \sum_{\tau=t+1}^{T}\pi_\tau - \sum_{\tau=t+1}^{T}\pi_\tau^* \qquad (6)$$

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

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 ($-b$):[10]

$$dq_i = d\tilde{q}_i - b \qquad (7)$$

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

$$\tilde{\pi}_i = \pi_i - b \qquad (8)$$

Equation (6) can be transformed into the following form using (7):

$$s_T = q_t + \sum_{\tau=t+1}^{T} d\tilde{q}_\tau - \sum_{\tau=t+1}^{T} b + \sum_{\tau=t+1}^{T} \pi_\tau - \sum_{\tau=t+1}^{T} \pi_\tau^* + p_t - p_t^* \qquad (9)$$

Equation (8) implies that:

$$\sum_{\tau=t+1}^{T} \tilde{\pi}_\tau = \sum_{\tau=t+1}^{T} \pi_\tau - \sum_{\tau=t+1}^{T} b \qquad (10)$$

Applying (10) 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 (9) can be rewritten as:

$$s_T = \tilde{q}_T + \sum_{\tau=t+1}^{T} \tilde{\pi}_\tau - \sum_{\tau=t+1}^{T} \pi_\tau^* + p_t - p_t^* \qquad (11)$$

Substituting (11) into (6), one gets the following expression for the spot exchange rate:

$$s_t = E_t\left[(\tilde{q}_T) - \sum_{\tau=t}^{T-1} (i_\tau - i_\tau^*) + \sum_{\tau=t}^{T-1} \rho_\tau + \sum_{\tau=t+1}^{T} (\tilde{\pi}_\tau - \pi_\tau^*) \right] + p_t - p_t^* \qquad (12)$$

[10] Where b is positive and can be interpreted as the annual percentage appreciation of the real exchange rate due to the catching-up process of the Hungarian economy. There is a wide literature on this phenomenon, for instance Égert et al. (2003) note that trend appreciation has become a stylized fact for the transition countries of Central and Eastern Europe and can be explained with the Balassa-Samuelson effect and an increase in tradable prices attributable to quality improvements. Further estimates of the Balassa-Samuelson effect are provided among others by Mihaljek et al. (2004) and Kovács (2002).

Without restricting generality, one can normalize 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:

$$s_t = E_t\left[(\tilde{q}_T) - \sum_{\tau=t}^{T-1} i_\tau + \sum_{\tau=t}^{T-1} \rho_\tau + \sum_{\tau=t+1}^{T} \tilde{\pi}_\tau\right] + p_t \quad (13)$$

Equation (13) 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:

$$s_t' = E_t\left[\tilde{q}_{T+1} - \sum_{\tau=t}^{T} i_\tau' + \sum_{\tau=t}^{T} \rho_\tau' + \sum_{\tau=t+1}^{T+1} \tilde{\pi}_\tau'\right] + p_t \quad (14)$$

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

$$s_t' - s_t = E_t\left[(\tilde{q}_{T+1} - \tilde{q}_T) - \sum_{\tau=t}^{T-1}(i_\tau' - i_\tau) + \sum_{\tau=t}^{T-1}(\rho_\tau' - \rho_\tau) + \sum_{\tau=t+1}^{T}(\tilde{\pi}_\tau' - \tilde{\pi}_\tau) - i_T' + \rho_T' + \tilde{\pi}_{T+1}'\right] \quad (15)$$

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