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What happened to the transatlantic capital market relations?☆

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ABSTRACT

This paper investigates the capital market relations between Euroland and the USA from 1990 until 2006. The UIP-implied long-run relation between European and US government bond yields is shown breaking down in the mid-1990s. However, contrasting with conventional theory, a stationary equilibrium exists additionally including the exchange rate. The reason proves to be a stochastic trend common to the European interest and the euro/dollar rate, which is explained by central bank reactions and unfinished learning processes on the role of the euro. Furthermore, the paper demonstrates a striking reduction in the US capital market dominance, leading to transatlantic interdependence at eye level.

1. Introduction

In the year 1999 eleven member states of the European Union (EU) joined to create the euro, a common currency dedicated to foster economic growth and integration in its area. In the course of the European integration process, this step marks the final stage in the historic formation of the European Economic and Monetary Union (EMU). Nevertheless, the first years saw non-trivial currency depreciation, giving grounds to discussions about the stability of the euro and its strength in international comparison. Meanwhile, the situation has changed, and concerns in Europe are rather directed to threatened export competitiveness.

In this context, one crucial question refers to the role of the euro area assets in international capital markets. On the one hand, the long-term interest rate, which is crucial for determining investment, is expected to react with respect to the domestic business cycle situation and monetary policy impulses. On the other hand, arbitrage between bonds denominated in different currencies, as stated by the uncovered interest rate parity (UIP), as well as exchange rate developments bring in foreign influences. The degree of internal autonomy a country can preserve apparently depends on its strength in international relations. This constellation makes capital market leadership to be a key factor for the interaction between financial sector and real economy.

Although the literature on international interest rate connections is well elaborated, analyses including EMU data remain relatively scarce. Up until now, for example Wolters (2002), Ehrmann and Fratzscher (2002, 2004), Chinn and Frankel (2003) as well as Brüggemann and Lütkepohl (2005) have considered interest rate relations between Europe and the US. As a main result, predominantly the European markets have been found depending on US influences, while reverse effects gained little significance. The present approach demonstrates an intriguing change in this pattern, which takes place since the mid-1990s and thus noticeably coincides with the third stage of EMU.

A furthermore important contribution of this paper lies in providing insight into the distinct role of the exchange rate in capital markets, since a remarkable development has taken place in the run-up to the euro introduction: Bivariate cointegration between the European and US bond yields confirms a necessary condition for validity of the classical UIP theory in samples beginning in the early 1990s. Thereafter though, a long-run equilibrium does not survive without including the euro/dollar exchange rate, which bears a positive sign. The reason turns out to be a systematic reaction of the European interest rate to exchange rate fluctuations, introducing a second stochastic trend into the system. Subsequent economic argumentation suggests that this phenomenon can be straightforwardly explained by monetary policy reactions of the European Central Bank (ECB) and still unfinished learning processes in the foreign exchange market concerning the role of the new European currency. Furthermore, despite the positive long-run relation between

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interest and exchange rate, the model features the common sense negative (i.e., appreciating) effects of yield-induced capital flows.

In terms of empirical methodology, I mainly employ multivariate time series analysis based on the notion of cointegration. The central estimations are carried out in vector error correction models (VECMs), where formally, I follow the procedure proposed by Johansen (1995). This allows for testing UIP validity, establishing long-run relations and analysing the adjustment to equilibrium deviations, which reflects the "balance of power" in the transatlantic relations. Furthermore, in order to shed light on changes and development of these relations, I apply the econometric tools within a backward recursive calculation scheme.

The underlying paper is organised as follows: Section 2 introduces the theoretical concept of the UIP, supplemented by the above-mentioned innovative considerations on the role of the exchange rate. Subsequently, I describe the econometric methodology, mainly the test and estimation procedures. Section 4 presents the various empirical results of the VECM estimations. In the end, a summary displays all relevant generalised interpretation of the findings and concludes the paper.

2. Economic foundation

The fundamental theory on international linkage between different bond yields is formalised in the UIP equation. The economic rationale of the UIP is the *ex ante* arbitrage condition between domestic and foreign capital markets: Interest differentials between assets with equal maturity measured in local currencies with otherwise similar characteristics must be offset by corresponding expectations on currency revaluation. This leads to the logarithmic UIP version

$$i_{t,m} - i^*_{t,m} = \frac{12}{m}\left(E_t s_{t+m} - s_t\right) + \rho_{t,m}, \tag{1}$$

where $i_{t,m}$ and $i^*_{t,m}$ are the annualised domestic and foreign interest rates with m month maturity, s_t is the logarithm of the spot exchange rate (in terms of domestic currency units per foreign currency unit) and E_t the conditional expectations operator. $\rho_{t,m}$ denotes the logarithm of a possible risk premium, reflecting risk aversion, differences in credit worthiness and such.

In line with the relevant literature, assume the exchange rate integrated of order one (I(1)). Then, under rational expectations, the first term on the right hand side of Eq. (1) should be stationary. Note that this term represents the expected change of the exchange rate over the maturity of the bonds. Presupposed that the risk premium $\rho_{t,m}$ behaves as an I(0) variable, a valid linkage following the UIP relation depends on interest differentials to be stationary, too. Hence, provided that interest rates represent I(1) processes (as confirmed in Section 4.1), domestic and foreign bond yields should be cointegrated with the vector $(1,-1)$.[1] Thereby, cointegration represents a necessary condition for the validity of Eq. (1). In the following, I will refer to this necessary condition as the "classical" UIP.

Different directions of research developed explanations for the frequently appearing empirical failure of classical UIP. For example, Juselius and MacDonald (2004) connect non-stationarity of interest rate differentials to long-run deviations from purchasing power parity (PPP). Another approach, e.g. Wolters (2002), combines UIP with the term structure of interest rates in order to uncover common stochastic trends in enlarged systems. Concerning the underlying empirical investigation, the Introduction already addressed the special role of the exchange rate. Indeed, results in Section 4.2 strongly substantiate the view that the exchange rate introduces an additional stochastic trend into the interest rate differential. Therefore, an adequate economic theory must explain the facts that the yield differential is non-stationary and that exchange and interest rates are cointegrated. Thereby, classical UIP (see above) leaves no room for the exchange rate, which appears as stationary expected change in Eq. (1), exerting any influence on the *long-run* cointegrating capital market equilibrium. As an important contribution beyond the current standard, below I explore two novel scenarios in this context, which are both particularly intriguing for the period under investigation. Note that this serves to motivate the trivariate cointegration models employed in the empirical part and to rationalise the surprising results. Though, it is not the aim of this paper to test these theories explicitly. Furthermore, the underlying study should not be understood as deeming alternative explanations (if any) irrelevant for the observed phenomena.

Firstly, a suitable mechanism could work through central bank acting, since a weakening currency for example might provoke contractionary monetary policy decisions; see McCallum (1994) amongst others ("McCallum rule"). In such a case, the exchange rate would enter the central bank reaction function, either due to its very own importance, or indirectly through induced fluctuations in monetary policy relevant measures like imported inflation and output fluctuations. As a simple illustrative example, consider the special form

$$r_t - r^*_t = \lambda\left(s_t - \bar{s}\right) + \tilde{r}_t \tag{2}$$

with $\lambda>0$. Here, the reference rate r_t, over and above its foreign counterpart r^*_t, is adjusted depending on the deviation of the exchange rate from its policy target $\bar{s}$[2]; any further relevant factors such as inflation and output gaps are included in $\tilde{r}_t$. Since the present focus is not on exploring comprehensive policy rules, this general simplistic form should be convenient for my purposes.[3] Eq. (2) clarifies that the interest rate r_t, relative to r^*_t, must contain a stochastic trend of strength λ from the exchange rate s_t.

Through the term structure, the policy rate impulses can be transmitted into the long-term capital market, where the relevant exchange rate information is continuously processed through market expectations. Logically, the policy acting approach can explain both non-stationarity of the interest rate differential and its cointegration with the exchange rate. While the exchange rate might enter the interest rate as in Eq. (2), the effect could as well be more indirect: For instance, depreciation might boost domestic inflation through import prices. Higher expected inflation rates would then be incorporated into expectations of future short-term rates that are averaged in long-term yields under the no arbitrage condition. In this context, see e.g. Taylor (1999), who argues that bond yields can react to exchange rate impulses even under a conventional Taylor-rule: Given agents expect responses of inflation and output to such a shock, according changes in future policy rates can be anticipated. In general, even if we were willing to trust official central bank statements denying any direct exchange rate targeting, the theoretical approach remains valid. For this issue, see as well Chinn and Meredith (2004), who construct a small macroeconomic model with endogenous monetary policy in order to reproduce the forward discount bias often encountered in standard short-horizon UIP regressions. From a different angle, Engel and West (2006) investigate the role of real-exchange-rate-augmented Taylor rules for retracing distinct empirical properties of pre-EMU DEM/USD exchange rates.

Secondly, I propose an explanation that works without introducing an additional player like the central bank. Logically, this scenario is

[1] Note that national taxation could lead to different weights.

[2] For example, $\bar{s}$ might be given by p_t/p^*_t, the relative price level, implying PPP as the relevant target (e.g., refer to Engel and West, 2006). Since the real exchange rate $s_t p^*_t/p_t$ closely follows the stochastic trend of the nominal rate s_t, the current empirical approach should comprise such a specification.

[3] Indeed, ARDL-type estimations reveal positive causal impacts from the euro/dollar exchange rate on European (not US) short-term interest rates; see as well Clarida et al. (1998). Though as already mentioned above, the underlying study is not about investigating policy rules, according results are available upon request.