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Financial stress and its non-linear impact on CEE exchange rates

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ABSTRACT

This paper studies the reaction of selected CEE (satellite) currencies to increased financial stress in the euro area (core) and also in global financial markets. We suggest that this reaction might be non-linear; the "safe haven" status of a satellite currency may hold in calm periods, but breaks down when risk aversion is elevated. A stylized model of portfolio allocation between assets denominated in euro and the satellite currency suggests the presence of two regimes characterized by different reactions of the exchange rate to an increased stress in the euro area. In the "diversification" regime, the satellite currency appreciates in reaction to an increase in the expected variance of EUR assets, while in the "flight to safety" regime, the satellite currency depreciates in response to increased expected volatility. We suggest that the switch between regimes is related to changes in risk aversion, driven by the level of strains in the financial system as captured by financial stress indicators. Using the Bayesian Markov-switching VAR model, the presence of these regimes is identified in the case of the Czech koruna, the Hungarian forint and the Polish zloty.

1. Introduction

One of the financial stability challenges of central European economies (CEE) outside of the euro area stems from foreign exchange risk. Like in other small open economies, movements in exchange rates affect balance sheets and earnings of private firms involved in international trade by altering the value of their exports and imports. On the financial side, corporations and households are exposed to foreign exchange risk due to the currency mismatch of their assets and liabilities. The impact of foreign exchange movements on the financial position of the real sector is further complicated in the CEE region by the ownership structure of its banks. Since the major banks, on which the private sector is dependent, are foreign owned and the parent companies are located in the euro area, investor's perception of their health can affect the exchange rates in the CEE countries. It is therefore plausible that a financial shock in the euro area countries ("core") directly unrelated to the CEE ("periphery") countries can result in the depreciation of the latter's currencies.

This paper explores the impact of financial stress in the "core" countries on exchange rates in the "periphery" countries. It suggests that the relationship can be non-linear and dependent on the degree of risk aversion. Our analysis is novel in several aspects. The previous literature has often considered the reaction of exchange rates to stress with the focus on carry trades and has assumed that the "safe haven" status of a currency is time-invariant. Here we take a more elaborate approach, recognizing that currencies which are "safe havens" in some periods may lose this status in more turbulent times. Further, we theoretically link these distinct regimes (labelled "diversification" and "flight to safety") to the attitude of institutional investors towards risk – risk aversion in general terms. Finally, we empirically test for the presence of such regimes in CEE currencies, finding that the Czech koruna (CZK), the Polish zloty (PLN) and the Hungarian forint (HUF) have switched the regimes several times, and those switches have coincided with periods of elevated risk aversion.

There are two major challenges for studying the link between exchange rate dynamics, financial stress and risk aversion. First, risk aversion as a behavioral characteristic of financial agents is an unobserved variable, and there are only estimates and proxies available. At the same time, risk aversion supposedly rises when the degree of financial stress itself is elevated. Therefore we are forced to reduce the three-dimensional problem into a two-dimensional one, investigating the reaction of exchange rates to financial stress and interpreting the non-linear responses and observed regime switches as related to elevated risk aversion causing behavioral

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change. At the same time, we argue that the regime switches do not occur at specific thresholds, as the measures of financial stress themselves are imperfect and a commonly measured level of stress in recent years may exceed peaks in previous decade, reflecting also structural changes in financial markets. Therefore, a more elaborate approach to the regime switching process is needed, and we opt for Bayesian Markov-switching VAR model.

Second, the existing literature has often suggested a simple link: an increase in risk aversion causes funds to be withdrawn from emerging economies and their currencies to depreciate. In contrast to this finding, we suggest that the reaction of emerging currencies (CZK, PLN and HUF) to increased uncertainty depends on the level of risk aversion in the core advanced economy (the euro area in our case). When euro area financial markets are calm and hence risk aversion is low, the search-for-yield effect drives trades in emerging currencies, including carry trades. This may lead to emerging currencies appreciating in response to a mild increase in uncertainty in the euro area. On the other hand, when advanced markets become turbulent, funds start to be withdrawn from satellite economies and an increase in financial stress causes the satellite currencies to depreciate. As a result, the link can be non-linear and the relationship can operate in several regimes.

This paper fills the gap in the literature on the link between financial stress and exchange rate movements in the CEE region in that it provides both theoretical background and empirical evidence. To start with, we present a simple model of a stylized currency portfolio where the endogenously selected weights of assets denominated in the "core" and "satellite" currencies in the optimal portfolio respond to changes in the variance (uncertainty) of euro area assets. In this model we identify two regimes (related to the degree of risk aversion and portfolio management strategy) based on the different reactions of the exchange rate to increased uncertainty. The "diversification" regime is characterized by the koruna appreciating in response to increasing uncertainty of euro asset returns, while the "flight to safety" regime is characterized by the koruna depreciating in response to increasing uncertainty of euro asset returns. Finally, using the Markov-switching model we manage to identify different exchange rate reaction regimes in the case of the CZK and HUF in reaction to financial stress captured by the CISS indicator of euro area financial stress, while the evidence for PLN is more mixed. Also, we do not find different regimes in the reaction of exchange rates to global stress captured by the VIX index, as the global stress does not directly relate to euro area domestic uncertainty and is therefore more likely to affect satellite currencies more uniformly in the "flight to safety" fashion.

The paper is structured as follows. First, it reviews relevant literature related to the concept of financial stress, its measures, and its impact on exchange rates. Next, based on a model of portfolio rebalancing, it provides a theoretical motivation for the link between the exchange rate and risk aversion. Finally, it estimates how have CZK, PLN and HUF reacted to the evolution of financial stress in the euro area and the global economy in the various regimes identified.

2. Financial stress and exchange rates

Financial stress can be described as a situation where the normal (smooth) functioning of financial markets is severely impaired. Under these conditions, the financial system is threatened by substantial losses. Financial stress is marked by a higher degree of perceived risk (a wider distribution of probable losses) as well as uncertainty (decreased confidence in the shape of that distribution), according to Misina and Tkacz (2008). The uncertainty leads to increased volatility of asset prices, which can then alter the risk aversion of traders. As a recent study by Kandasamy et al. (2014) shows, during periods of extreme market volatility traders' attitude toward taking risks changes. We make use of this link when exploring the reaction of a selected currency exchange rate to increased uncertainty in foreign financial markets.

2.1. Measuring financial stress

Financial stress indicators aggregate a set of stress measures, such as volatilities and spreads, from various market segments, such as the money market, bond market, stock market, and foreign exchange market,[1] into a single time series. Even early papers on financial stress, which used simply constructed stress indicators (in terms of the aggregation methods or variables used), were able to capture most stressful events as perceived by experts (Illing and Liu, 2006). But over time, more elaborate indices have been constructed. In particular, the global financial crisis gave a strong impulse to research in this field, highlighting the importance of financial stress for real economic activity.

The construction of indices varies both in the stress measures included and in the methods used to aggregate them. To the best of our knowledge, there is little theoretical background for modeling financial stress, so these choices are often arbitrary. Several indicators have been constructed for individual economies (such as the U.S., the euro area, and Canada) as well as more general ones to be used across countries (Cardarelli et al., 2009). A number of studies have shown the impact of financial stress on real or financial variables as well as on monetary policy, but the financial stress indicators themselves seem difficult to predict according to Slingenberg and De Haan (2011) and their potential use in forecasting so far seems to be limited.

In the post-crisis period, the focus has shifted to the construction of financial stress indicators to capture systemic risk. The contagion effect is an import element of systemic risk, so these indices should reflect situations where stress materializes simultaneously in several interconnected markets. Brave and Butters (2012) constructs a state-space representation of the level of systemic stress. This approach takes into consideration the cross-correlations of a large number of financial variables (100 indicators) and the past development of the index to set the weights for each sub-index. Standard portfolio theory is used by Holló et al. (2012), who aggregate subindices in a way which reflects their cross-correlation structure. This approach has been applied to Czech data (Adam and Benecká, 2013) and Hungarian data (Holló, 2012), but generally the attention paid to the role of financial stress in the Central European region (CEE) has been relatively limited.[2]

In this paper, we build on the financial stress literature and use two financial stress indices for the euro area in our analysis. The Composite Indicator of Systemic Stress (CISS) by Holló et al. (2012) will be employed first as a an index of financial stress in the "core" economy (euro area). Its construction not only incorporates information about conditions in individual markets, based primarily on volatility, but also captures the effect of simultaneous stress in each of them. The CISS index is updated on a weekly frequency and is regularly used as a measure of euro area systemic stress by the ECB, in the ESRB Risk Dashboard and has been also employed in academic studies (Vašíček et al., 2017; Dovern and Van Roye, 2014; Gelman et al., 2015). As an alternative, we will use the VIX index of implied option volatilities in S&P 500 index to capture the level of

[1] Some studies additionally include macroeconomic or financial stability indicators (such as private credit) to capture the overall economic conditions. We stick to the financial markets context as we intend to assess the impact of financial stress only.

[2] Due to the importance of banking sectors in CEE compared to other financial segments, the focus has been on developing banking-oriented or broader financial stability indices.

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