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Understanding bilateral exchange rate risks ☆

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ABSTRACT

We apply the autoregressive conditional jump intensity (ARJI) model to weekly bilateral exchange rate returns of 31 countries and examine the determinants of bilateral exchange rate risks over the period 2001–2013. Consistent with the balance sheet effects in the open economy literature, we find that bilateral exchange rate risks are significantly reduced by external financial liabilities, above and beyond the standard optimal currency area (OCA) factors, and the development of domestic financial sectors will attenuate this effect. Subsample analysis reveals that developed countries also face credit constraints in the global capital market and the negative effects of external liabilities on bilateral exchange rate risks are increasingly pronounced in countries facing more credit constraints.

1. Introduction

Since the collapse of the Bretton Woods exchange rate system in March 1973, the sources of exchange rate risk have been extensively studied by researchers seeking to understand why foreign exchange rates fluctuate (Bayoumi and Eichengreen, 1998; Devereux and Engel, 2002; Devereux and Lane, 2003; Giannellis and Papadopoulos, 2011). While most of these studies have already examined

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the determinants of exchange rate volatility, few of them investigated the sources of exchange rate jump risk.[1]

Compared to continuous price changes, jump risk has distinctly different implications for risk measurement and management, portfolio allocation, and the valuation of the derivative securities (Jiang et al., 2011). The jumps in financial markets with occasional large price changes and extreme volatility represent a significant source of non-diversifiable risk (Bollerslev et al., 2008; Eraker et al., 2003). Jump risks are not only important for investors who may demand a large premia to carry these risks (Pan, 2002), but also vital for policy makers who must make decisions in real time during times of jump-inducing chaotic conditions in financial markets. While recent literature has underscored the importance of modeling jump dynamics on exchange rate markets in itself, the sources of exchange rate jumps risk are left unexplored. Filling this gap, this paper examines the determinants of bilateral exchange rate risks in a comprehensive way.

Extending the balance sheet effects to the open economy, Devereux and Lane (2003) build up a theoretical model to exhibit the important role of financial factors in affecting the efficiency of the exchange rate in responding to external shocks. In a cross-sectional regression model, they document a negative relationship between external debt and exchange rate volatility in developing economies. The effect of external debt on bilateral exchange rate volatility is insignificant for industrial economies. The plausible explanation for this is because industrial countries do not face financial constraints in international financial market. They further interpret the results as the evidence for the balance sheet effects in the open economy.

In this paper, we rely on a panel estimation to explain time-varying bilateral exchange rate volatility and jump intensity between 31 developed and developing economies over the time period 2001–2013. We believe that allowing for the time-fixed effects as well as unobservable country-pair-level factors to influence bilateral exchange rate risks is crucial in reducing the omitted-variable bias. To further address the potential omitted-variable bias, we also control for a set of variables capturing the uncertainty about the macroeconomy and government policy in the robustness check.

We first estimate the bilateral exchange rate volatility and jump intensity using an autoregressive jump intensity (ARJI) model developed by Chan and Maheu (2002) and further augmented by Maheu and McCurdy (2004). The model allows the conditional jump intensity to be time-varying and follows an approximate autoregressive moving average (ARMA) form. The estimation results show a surge of volatility and jump intensity during notorious financial crises such as the subprime and the European sovereign debt crisis, as shown in Figs. 1–3. It indicates that the ARJI model indeed provides a good measure of volatility and jump dynamics of bilateral exchange rates.

We next examine the determinants of the bilateral exchange rate volatility and jump risk. After controlling for the endogeneity of the bilateral trade and external financial liabilities, our empirical results show that the effect of OCA variables on bilateral exchange rate risks is consistent with standard theory: greater bilateral trade reduces bilateral exchange rate risks, smaller countries are more reluctant to tolerate fluctuations in exchange rate, and the asymmetric shocks to output magnify exchange rate fluctuations, which means asymmetric disturbances to output would increase the desirability of a flexible exchange rate regime as an adjustment mechanism. More importantly, we find that financial variables play a significant role in explaining exchange rate risk, above and beyond the OCA set of variables. The bilateral exchange rate risks are significantly reduced by external financial liabilities, and domestic financial development will attenuate this effect. It indicates that, controlling for the omitted-variable bias, the credit constraints induced by external debt will reduce the efficiency of the exchange rate in responding to external shock for the developing and developed economies.

To further exploit the possible transmission mechanism through which external financial liabilities exert a negative effect on bilateral exchange rate risks, and the role of domestic financial market in attenuating this effect, we examine the effect of external financial liabilities on exchange rate risks

[1] While this literature assumes that volatility is good enough as a proxy for exchange rate risk, the recent studies have found that the standard models based on Brownian motion fail to explain some characteristics of asset prices, like occasional jumps. To overcome this inadequacy, jump diffusion models have been proposed. An incomplete list includes Merton (1976), Jorion (1988), Akgiray and Booth (1988), Bates (1996a, 1996b), Andersen et al. (2001), and Duffie (2010).