Journal of International Money and Finance 89 (2018) 83–102

Contents lists available at ScienceDirect

Journal of International Money and Finance

journal homepage: www.elsevier.com/locate/jimf

Currency downside risk, liquidity, and financial stability

Helena Chuliá [a,*], Julián Fernández [b], Jorge M. Uribe [b,c]

[a] Riskcenter-IREA and Department of Econometrics, Universitat de Barcelona, Av. Diagonal, 690, 08034 Barcelona, Spain
[b] Department of Economics, Universidad del Valle, Colombia
[c] Riskcenter-IREA, Universitat de Barcelona, Spain

ARTICLE INFO

Article history:
Available online 19 September 2018

JEL Codes:
E44
F31
G01
G12
G15

Keywords:
Foreign exchange
Spillovers
Currency crises
Networks

ABSTRACT

We estimate volatility- and quantile (depreciation)-based spillovers across 20 global currencies against the US Dollar. In so doing, we reveal significant asymmetries in the propagation of risk across global currency markets. The quantile-based statistic reacts more significantly to events that have a sizable impact on FX markets (e.g. Brexit vote and the FX crash following the subprime crisis), which are missed by the volatility-based statistic. As such, our tail-spillover estimates constitute a new financial stability index for the FX market. This index has the advantages of being easy to build, of not requiring intraday data and of being more informative about currency crises and pressures than traditional spillover statistics based on volatilities. Finally, we also document differences in the relation between liquidity and volatility (quantile) spillovers.

1. Introduction

Currency crises have been of particular concern for policy-makers, regulators, practitioners and academics since at least the post-Bretton Woods era (Krugman, 2000). In the intervening years, one of the most frequently examined – albeit one of the least understood – issues related to such crises have been the mechanisms of propagation of currency shocks, be they a consequence of macro-fundamentals, coordinated polices, common-lenders, speculative attacks or simply a result of unexpected (or unexplained) mechanisms (pure-contagion).[1] Yet, co-movements and risk spillovers in currency markets can have an enormous economic and social impact on financial and macroeconomic stability and, hence, on wellbeing.[2] Currency shock spillovers have been shown to be closely linked to global imbalances, investor speculation, sovereign debt concerns (Chen, 2014), sudden stops, sharp real depreciations and asset price crashes (Apostolakis and Papadopoulos, 2015; Korinek and Mendoza, 2014) and, therefore, to financial collapses. Currency trading, measured in dollar volume, represents the largest financial market on the planet: an average of $5.1 trillion each day according to the latest Triennial Central Bank Survey conducted by the Bank for International Settlements (Bank of International Settlements, 2016). Hence, understanding spillovers in foreign exchange (FX) markets is critical for maintaining financial stability.

* Corresponding author.
E-mail addresses: hchulia@ub.edu (H. Chuliá), julian.fernandez.mejia@correounivalle.edu.co (J. Fernández), jorge.uribe@correounivalle.edu.co (J.M. Uribe).

[1] See Rigobon (2002) and references therein for a discussion about contagion, including currency markets.
[2] See Krugman (2000) and references therein.

https://doi.org/10.1016/j.jimonfin.2018.09.009
0261-5606/

There is a well-established branch of the macro-financial literature that empirically studies spillovers in FX markets (Baillie and Bollerslev, 1990; Engle et al., 1990; Ito et al., 1992; Hogan and Melvin, 1994, Hong, 2001; Melvin and Melvin, 2003; Cai et al., 2008; Bekiros and Diks, 2008; Bubák et al., 2011; Coudert et al., 2011; Li, 2011; Antonakakis, 2012; Kavli and Kotzé, 2014; Diebold and Yilmaz, 2015; Greenwood-Nimmo et al., 2016). Some of these studies focus specifically on spillovers between highly traded currencies (for instance, Greenwood-Nimmo et al., 2016) while others also include emerging market currencies with lower trade volumes (e.g. Kavli and Kotzé, 2014; Coudert et al., 2011).

The study of return and volatility spillovers in currency markets imposes its own symmetry on the analysis, by implicitly assuming that for any given country the situation is roughly the equivalent of facing depreciation or appreciation pressures.[3] This assumption is at the very least controversial. In the worst-case scenario, central banks may *lean against the wind* when appreciation pressures emerge on the horizon, to the degree that they are willing (or politically allowed) to do so. On the other hand, their response is much more restricted when faced by an episode of depreciation. Here, in the worst case they are bound by the (frighteningly) lower limit of the FX reserves.

The aim of this paper is to analyze *downside* risk propagation across global currency markets and the ways in which it is related to liquidity. We make two primary contributions to the literature. First, we estimate *tail-spillovers* between currencies in the global FX market. Unlike previous studies that focus on return co-movements and volatility spillovers in currency markets, we directly address the issue of risk spillovers in the left tail of the daily variations in currency prices (depreciations). We do so by closely adhering to what we consider a key element in the definition of a currency crisis proposed by Paul Krugman: "[it] is a sort of circular logic, in which investors flee a currency because they fear that it might be *devalued*, and in which much (though not necessarily all) of the pressure for such a *devaluation* comes precisely from that capital flight" (Krugman, 2000, p 1. The emphasis is ours). Notice that by definition currency crises are related to periods of depreciation (or devaluation), and not to episodes of appreciation (or revaluation). Thus, in terms of financial stability, episodes of depreciation are more significant than those of appreciation.

Our strategy allows us to consider specifically *downside risk* in currency markets, corresponding in this instance to episodes of *depreciation* of the global currencies against the US dollar. This is more consistent with the definition of a currency crisis. Indeed, there exists recent empirical evidence that points out the asymmetric propagation of volatility shocks depending on whether they are related to depreciation or appreciation episodes (or correspondingly to bad and good volatility shocks). Galagedera and Kitamura (2012) model the interaction between returns and volatility in an autoregressive system that accounts for asymmetries in the propagation of shocks. These authors show that during the subprime crisis the depreciation of the US dollar against the Japanese yen produced a larger impact on US dollar-yen volatility spillover than appreciation did. Not such an effect was observed for the U.S. dollar against the euro. In the same general lines, Baruník et al. (2017) document dominating asymmetries in spillovers, which are due to bad rather than good volatility. They also show that negative spillovers seen to be tied to sovereign debt concerns, while positive spillovers have been mainly associated with the global financial crisis. These asymmetries are fundamental to our study of extreme depreciation quantiles. Additionally, our tail-spillover estimates can be used to construct a new financial stability index for the FX market. This index is easy to build and does not require intraday data, which constitutes an important advantage.[4]

Our second contribution is that we explore whether turnover is related to risk spillovers in global currency markets. In this respect we draw inspiration from Mancini et al. (2013) and Karnaukh et al. (2015), who document a significant relationship between currency liquidities (i.e. commonality). Our intuition is that liquidity matters for spillovers. World currencies can be expected to behave differently depending on how much investors trade them and, in turn, commonality may become evident by examining the dynamic spillovers in worldwide FX markets.

In line with Diebold and Yilmaz (2015), we opted to include in our sample of 20 currencies against the US dollar those with high trading volume ratios (Euro, Yen, British Pound, Australian Dollar, Canadian Dollar, Swiss Franc, Swedish Krona, Mexican Peso, New Zealand Dollar, Singapore Dollar, and Norwegian Krone) as well as those with considerably lower market transaction levels (South Korean Won, Turkish Lira, Indian Rupiah, Brazilian Real, South African Rand, Polish Zloty, Thai Baht, Colombian and Philippine Pesos). In this way, we seek to provide a more comprehensive panorama of global FX market dynamics.

Our methodology consists of two steps. First, we estimate intraday range volatilities and conditional quantiles. Then we use these series as input to construct traditional Diebold and Yilmaz (2012, 2014) statistics, net pairwise statistics and networks. Obvious alternatives for constructing asymmetric spillovers are semi-variances (Barndorff-Nielsen et al., 2010). However, these semi-variances, especially the measure of 'bad volatility', are based on 'fill-in asymptotics', and require intraday prices to be computed on a daily basis. Our measure is based on conditional quantiles and does not require this level of detailed information. Second, our measure focuses specifically on a high depreciation-quantile (VaR at 95% of confidence), as opposed to the full spectrum of 'bad volatility', which refers approximately to 50% of the variations. It is our contention that the two steps outlined above represent compelling advantages of our proposal.

We document significant asymmetries in terms of risk propagation that become evident after comparing volatility-based and quantile-based spillover measures. The quantile-based statistic reacts more significantly to events that have a sizable

[3] The importance, on empirical grounds, of considering asymmetries when modeling exchange rate variations has been documented for instance by Patton (2006) and Reboredo et al. (2016). Unlike the analysis reported herein, these studies neither consider dynamic spillovers nor focus on currency crises and systemic risk, rather they model pairs of series – the Deutsche Mark and US Dollar in the former case and stock returns against exchange rates for emerging economies in the latter.

[4] Our index is available on http://www.ub.edu/rfa/currency-crisis-index/.