Journal of Empirical Finance 33 (2015) 67–83

Contents lists available at ScienceDirect

Journal of Empirical Finance

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

Euro at risk: The impact of member countries' credit risk on the stability of the common currency☆

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ARTICLE INFO

Article history:
Received 24 November 2014
Received in revised form 26 June 2015
Accepted 28 June 2015
Available online 3 July 2015

JEL classification:
G13
F31

Keywords:
European sovereign debt crisis
Currency options
Credit default swaps
Currency stability
Crash risk
Sovereign capital structure arbitrage

ABSTRACT

In this paper, we propose a new indicator of Euro stability. We make use of this new indicator and empirically investigate the impact of changes in sovereign risk of Eurozone member countries on the stability of the Euro. The stability of the Euro is proxied by decomposing Dollar–Euro exchange rate options into the moments of the risk-neutral distribution. Our stability measure can nicely separate periods of Dollar instability (the subprime crisis period) and Euro instability (the sovereign debt crisis period). In particular, we document that only during the sovereign debt crisis, changes in the creditworthiness of member countries with vulnerable fiscal positions have a significant impact on the stability of the common currency. Interestingly, however, the market perceives Greece not to be 'systemically relevant'.

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> *"The euro is an island of stability. It has to go back to being also an island of prosperity and job creation but certainly it is an island of stability."*
>
> [Mario Draghi, ECB. Press conference in Frankfurt am Main on March 6, 2014]

1. Motivation

In view of the sovereign debt crisis, understanding the dynamics of the credit risk of the Euro-area countries proves urgent so as to prevent dire scenarios. At worst, the default of a major country would unleash the currency break-up, ravage the European banking system and ultimately engender a global economic slump. In this study, we view the Eurozone sovereign debt crisis through the twin lenses of sovereign credit swaps and currency option markets. In the absence of Eurobonds, we empirically examine the impact of the credit risk of member countries on the stability of the Euro.

☆ We thank Dale Gray for invaluable discussions. The research presented in this paper has been given financial support by the National Research Fund of Luxembourg (FNR).

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http://dx.doi.org/10.1016/j.jempfin.2015.06.004

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The credit risk of a country can be measured through its sovereign credit default swap (CDS). Market prices of CDS spreads reflect the perception of financial markets about the economic–political stability of a country, and thus about the creditworthiness of a given sovereign. As shown by Pan and Singleton (2008), the changes in credit risk premiums of sovereign markets which translate into changes in sovereign CDS spreads, do not emanate from changes in fundamentals of the underlying economies. Rather, these variations mirror a change in the risk appetite of market participants in terms of credit exposure. A negative change in the creditworthiness of a sovereign inevitably translates into a depreciation of its currency along with soaring currency volatility. Furthermore, currency option prices are instruments which are capable of predicting the changes in the realized volatility of currency returns. Based on data from the Mexican and Brazilian Markets, Carr and Wu (2007) establish a relationship between sovereign CDS spreads and currency return volatilities induced through implied-volatilities of currency options and risk reversals.[2] Their results indicate that the sovereign CDS spreads covary substantially with the risk reversals. In the same spirit, Hui and Fong (2011) report similar results while focusing on the interconnectivity between the US and Japan sovereign CDS markets and the currency option market characterized by risk reversals of options on the Dollar–Yen exchange rate. Compared to Japan, the US sovereign credit risk is shown to have a significant impact on the risk reversal. Therefore it is deemed to play a more significant role in the way markets form expectations on the Dollar–Yen exchange rate.

Turning to the European context, Hui and Chung (2011) document information transmission from the sovereign CDS market to the currency option market. Using implied volatilities of options on the Dollar–Euro exchange rate as a measure of crash risk, they conclude that the credit risk of the Eurozone is a distinct factor which determines the prices of the out-of-the-money Euro put option prices. The recent Eurozone crisis is viewed from various angles by the literature. Azerki et al. (2011) and Afonso et al. (2011) use the perspective of credit rating agencies and show that sovereign rating announcements have spillover effects on the European financial markets. They firstly study the response of sovereign CDS spread, banking stock index, insurance stock index and country stock while they secondly focus on the response of government yield spreads. Either way news about downgrades is found to have significant spillover effects. However, the linkages with currency option markets are not considered. Another perspective is that of Calice et al. (2011) who analyze the Eurozone crisis by modeling liquidity in the sovereign CDS markets. They find evidence that the liquidity of CDS markets of struggling countries such as Greece, Portugal and Ireland has a substantial impact on sovereign debt spreads. An earlier strand of literature tackles the question of currency crash risk from a macro-economic angle and explains currency crash risk by economic fundamentals. It provides empirical evidence from developing countries of a relationship between macro-economic indicators and weak currencies. Countries with weak fundamentals are less likely to be able to defend their currencies against speculative attacks (Wolff (1987), Eichengreen et al. (1996); Frankel and Rose (1996); and Kaminsky et al. (1998) are a few examples).

Our study also relates to a recent strand of literature, which attempts to link currency crash risk to the distribution of exchange rate. Notwithstanding the sound models and explanations established by this strand, it does not take into account sovereign credit risk. Brunnermeier et al. (2009) detect negative skewness in the movements of exchange rates involving a low-level interest rate currency and a high-level one. This boils down to saying that Carry trade strategies are exposed to crash risk. The authors argue that the skewness is triggered when such strategies take place in an abrupt manner reflecting lower risk appetite and higher liquidity constraints. Currency risk with respect to Carry trade strategies are also examined in work by Fahri et al. (2009). The main risk of these strategies emerges from the value of the exchange rate at the end. The authors propose an exchange model to distinguish between "disaster" and "Gaussian" premia in the currency option markets. The model entails a strong relationship between interest rates, changes in exchange rates and levels of risk reversals. The main empirical implication indicates that disaster premium explains 25% of Carry trade returns. In others words, crash risk drives currency returns considerably. Other papers, which find a similar result by analyzing crash risk from the perspective of currency options include the work of Jurek (2009) and Burnside et al. (2011).

Moreover, our study is related to the literature examining the linkage between corporate CDS and stock option markets and the information transmission inherent to these markets. Examples include work by Acharya and Johnson (2007), which presents empirical evidence on the existence of information transmission from the corporate CDS to the stock market. This phenomenon is detected for firms which were subject or are likely to be subject to negative credit news and which maintain strong ties with banks. The analysis of the relation between CDS spreads and implied-volatilities in the work of Cao et al. (2012) shows that the information embedded in the implied volatilities of deep out of the money put options is able to explain the variations in CDS spreads. The skew of the implied volatilities is also computed so as to examine its effect on CDS spreads. Important to note is the fact that this implied volatility is related to the negative tail of the risk neutral probability. Besides, the information embedded in it reflects both future volatility and risk premium.

In an effort to shed more light on the current sovereign debt crisis, our study proposes the use of a sound and state-to-the art measure to assess the stability of the Euro. Based on the framework of Bakshi et al. (2003), the stability of the Euro is examined by decomposing Dollar–Euro[3] exchange rate options into the moments of the risk-neutral distribution. The method is used in the recent empirical equity option pricing literature (see e.g. Bams et al. (2009) and Neumann and Skiadopoulos (2013)). In particular, we compute model-free risk-neutral volatility, skewness and kurtosis measures from the cross-section of currency option prices, which allow us to derive proxies for the stability of the Euro. The idea of assessing the stability of a currency via exchange rate options is new in the literature. However, exchange rate option prices contain information about expectations of market participants regarding future movements of the exchange rate, in our case the future relative value of the Euro vis à vis the Dollar. The risk of a future depreciation or appreciation of the Euro can be inferred from the risk-neutral variance. Skewness is typically interpreted as the Euro crash risk, it provides an indication in which

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[2] Risk reversal is the difference in volatility between similar out-of-the-money call and put options. A positive risk reversal implies that market participants are expecting an appreciation rather than a depreciation of the local currency. The risk reversal conveys information about the skewness of the exchange rate distribution.

[3] The quotation 'Dollar–Euro' refers to the amount of Dollars needed to obtain one unit of Euro.

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