

Calculating the Unthinkable: Exchange Rate Effects of a Credit Event*

Arne Breuer and Oliver Sauter[†]

March 2013

1 Introduction

Over the last few years, there has been an unusual level of insecurity in capital markets in the wake of a series of interdependent economic and financial crises. After the U.S. housing bubble began to collapse in 2007, Lehman Brothers went bankrupt in 2008, which tipped off a global financial crisis. To prevent a collapse of the interbank market and the entire financial system of the western hemisphere, the governments and central banks nationalised some banks and poured hundreds of billions of Dollars and Euros into the struggling financial system.

This massive flow of money led many market participants to reconsider sovereign default risk. In the wake of the introduction of the Euro and the subsequent import of stability, especially the mediterranean countries such as Spain, Italy, Portugal and Greece had been able to borrow money at previously unheard interest rates. The financial crisis made markets re-evaluate their default risk and stopped lending money for quasi-negligible spreads over the German reference rate. In the long

*We thank Hinnerk Breuer and Felix Geiger for valuable comments. Of course, all errors remain our own.

[†]This is a summary of our article “The Impact of a Sovereign Default within the Euro Zone on the Exchange Rate” forthcoming in the Applied Economics Quarterly. For further information on our calculation or illustrative plots, the interested reader is referred to [Breuer and Sauter \(2013\)](#).

run, however, this posed serious problems for the governments of the now-famous PIIGS countries, a slightly disrespectful acronym for the mainly affected countries Portugal, Ireland, Italy, Greece and Spain. In order not to let any of the struggling countries run out of money, the members of the euro zone created rescue packages to step in for the dried-out mediterranean sovereign bond markets. Later, these rescue schemes were transferred into the European Financial Stability Facility (EFSF), which is in turn to be succeeded by the permanent European Stability Mechanism (ESM).

The reason for the expensive rescue packages and the creation of new dedicated European institutions is the fact that nobody knows what happens when a member of the euro zone will be unable to repay issued bonds, hence, declares a default. Yet, the default of sovereign entities is not a new phenomenon. For example, the Argentine default at the beginning of the 2000s is covered by a large number of papers (see, e.g., [Merrick Jr. \(2001\)](#), [Cifarelli and Paladino \(2004\)](#) or [Arellano \(2008\)](#), among many others). However, markets have not yet had to experience a default of a member of the monetary union of the European Union. Nobody knows what will happen in this case, which is why the European policymakers are willing to spend large amounts of money in order to prevent any member country from defaulting and possibly causing a destructive domino-effect.

In our article “The Impact of a Sovereign Default within the Euro Zone on the Exchange Rate” ([Breuer and Sauter 2013](#)), we show that it is possible to imply some consequences of a credit event of a member of the euro zone. With a simple purpose-built CDS portfolio, it is possible to calculate the (market’s opinion of) the change of the EUR-USD exchange rate in the wake of a default event of a member of the Eurozone.

The following pages capture some aspects of [Breuer and Sauter \(2013\)](#). However, the full article is available via the journal’s homepage.¹

¹ www.aeq.diw.de or <http://ejournals.duncker-humblot.de/loi/aeq>

2 Methodology

To calculate the EUR-USD exchange rate effects of a credit event of a member of the euro zone, we create a portfolio of credit default swaps (CDS) referencing to the same sovereign entities. For European sovereigns, it is possible to trade CDS that are denominated either in Euro or US-Dollars. These CDS are currently much-discussed, see, e.g. [Felsenheimer \(2012\)](#) or [Pollack \(2011\)](#). In normal times, the difference of the spreads (or prices) of CDS, denominated in different currencies, but referring to the same entity, is negligible; from the perspective of the protection buyer, the sovereign CDS is mainly used to lock in a specific level of default risk and benefit from increases of default risk; from the perspective of the protection seller, CDS are traded to benefit from decreasing levels of credit risk of the reference entity. The default risk is usually only theoretical for developed countries.

Being able to receive or pay the cash-flows in Euro rather than Dollar can be desirable, because it possibly eliminates a currency risk. It becomes very undesirable, however, when there is the risk of an actual default and not only of default risk changes; the reasoning of the counterparties changes. In the case of a default of a European member country, especially the protection buyer would not want to have the CDS denominated in Euro in their portfolio, because in the light of a significant possibility of a default, it is hard to estimate the value of the default payments that are due in the case of a credit event. It is likely that in the case of a default, the Euro is likely to depreciate versus the US-Dollar, so it would be desirable to receive cash-flows in Dollar rather than Euro. This fact is reflected in the CDS prices. Following this reasoning, CDS that are denominated in Dollar have a higher spread after controlling for the current exchange rate than CDS denominated in Euro, due to the better position after a possible European default.

However, this leads to a logical problem. Since the CDS share the same reference entity and therefore the same default risk, arbitrageurs could make a riskless profit by selling protection denominated in Euro and simultaneously buying protection denominated in Dollars. Because the spread of the two different CDS differs, the Dollar position pays more than the Euro position requires. However, “there ain’t no such thing as a free lunch”. The remaining arbitrage profit can be regarded as the expected depreciation of the Euro versus the US-Dollar in the case of a credit

event of the reference entity. We use this phenomenon to calculate the expected depreciation of the Euro versus the US Dollar following a sovereign default in the euro zone.

Intuitively, the depreciation of the Euro should be different across the countries. A rather small country like Luxembourg, for example, should only have a minor impact on the EUR-USD exchange rate, since the share of Luxembourg's economy is only 0.4% of the GDP of the European Union and is not very indebted, which means the euro zone's financial system would not be affected too much by a default. On the contrary, the effect of a rather large economy with comparatively high levels of sovereign debt, such as Germany, would be more profound. With a share of 23.5% on the GDP of the EU, and a high absolute level of government debt, a German default would have a destructive effect not only on the EUR-USD exchange rate.

3 Data & Findings

We use CDS data from Thomson Reuter's Datastream to calculate the implied effect of a sovereign default on the exchange rate. These values are spread midpoints of sovereign CDS with the reference entities Germany, France, Austria, Spain, Italy, Greece, Portugal and Ireland. Since the CDS market is an over-the-counter market, reliable CDS data is hardly available and of very different quality, depending on the data provider (see [Mayordomo et al. 2010](#)). We acknowledge these problems, e.g., the possible effects of a low liquidity of the instrument on our results. Unfortunately, any research relying on CDS data has to deal with this problem; this makes it necessary to take the results with a pinch of salt.

One of the main findings of [Breuer and Sauter \(2013\)](#) is that – opposed to the commonly made distinction of PIIGS and non-PIIGS countries – the market has a more detailed picture of the situation. Grouping them by their expected exchange rate effect in case of a default, CDS market participants seem to group the countries with more consideration.

To give an impression of our analysis and the conducted results, Figure 1 plots the implied EUR-USD exchange rate in case of a default of one member country of the European Union, namely, Germany (green), Italy (red), Austria (blue), and Cyprus (violet). For reference, the actual exchange rate is plotted as a dashed

line. These values give the (daily) implied or expected exchange rate, which must be realized neutralize the two CDS positions, denominated in different currencies. Obviously, the actual exchange rate, as well as the CDS spreads differs from day-to-day, hence, as well our implied exchange rate varies over time.

We hypothesise that three different reasons predominantly explain the severeness of deviations from the current exchange rate in case of a default: the relative size of the country, its perceived importance and whether or not the developments are already incorporated into the current exchange rate.

Currently, the most interesting country to analyse for the severity of the implied exchange rate effect is Cyprus. With its ongoing struggle whether or not to fulfill the requirements of the Troika to receive a European bailout, it is currently most likely to trigger a default event. CDSs referencing Cyprus are not the ones with the best levels of liquidity, however. Nonetheless, we include it into our dataset to show its implied effects of a credit event. In a word, the effect is almost negligible only considering the exchange rate. This is possibly due to two reasons. First, it is a very small country only counting for less than one per cent of the European GDP. Second, Cyprus triggering a default is most likely already priced into the spot exchange rate. The small increase of the implied depreciation from July to September 2012 is likely to be the effect of the Cypriot announcement of severe banking sector problems. It shifted the attention of the markets away from the usual PIIGS countries to Cyprus, causing a temporary deviation from a near-zero-effect.

On the contrary, Austria – which has a much larger economy than Cyprus, but still rather second-tier European economy, has an implied effect almost as pronounced as Germany’s, the largest European economy. The reason is most likely that an Austrian default is simply regarded as unlikely and therefore not priced in the spot exchange rate. An Austrian default would have a devastating effect on the general condition of euro zone, since it is still regarded as a “safe” country. Quite likely, an Austrian default would be preceded by other defaults of weaker countries, causing the Austrian default to reveal a large combined effect of two or more defaults.

Italy is the euro zone’s third largest economy, after Germany’s and France’s. An Italian credit event is currently certainly more likely than an Austrian one.

Therefore, its effect is priced in the spot exchange rate to a certain degree. However, this pricing is only effective to a certain degree; the data show that an Italian default would lead to an approximate immediate depreciation of around 20%.

Germany is the euro zone's biggest economy and at the same time one of the few countries with a relatively undisputed AAA-rating. Therefore, a German credit event would have the largest impact on the exchange rate, with an implied depreciation of around 50%.

Note that it should not matter too much if the euro would survive such an event; the CDS is a contract between two parties, and even after a destructive blow and the breakup of the euro zone, the contract would continue to exist. Probably, the contract would have to be settled with a basket of successor currencies, whose combined exchange rates should be more or less reflected by the implied exchange rates.

4 Conclusion

We use CDS to infer the exchange rate effect of a credit event of a member of the euro zone. Since it is likely that the Euro will depreciate versus the US-Dollar in the case of a credit event of a European member state, it is desirable to receive Dollars rather than Euros as recovery payment. This results in higher credit spreads for CDS denominated in Dollars than for CDS denominated in Euros. We use this feature to calculate the "market's opinion" on the country-specific impact of a credit event on the EUR-USD exchange rate.

We construct a portfolio of two CDS that are denominated in two different currencies, Euros and Dollars: We sell protection on Euro denominated risk and buy protection on Dollar denominated risk. We adjust the notional values so that the premium payments just offset each other. Since the credit spread of CDS denominated in Dollars is higher than the one denominated in Euros, the notional values and consequently the expected recovery payments of the two positions differ. In an efficient market, this difference can be explained with future changes in the exchange rate.

Of course, this exchange rate effect varies across the euro zone members. We hypothesise two main forces which drive deviations of the CDS implied exchange

rate and the spot exchange rate: (i) the size of a country and (ii) its default probability. The larger the size of a member state, the larger the difference to the actual exchange rate. The larger the probability of a default, the smaller the difference. These effects can reinforce each other as well as they can dampen or offset each other.

The expected devaluation of the Euro in the case of a German default is obviously greater than that of a Cypriot default. The data show that market participants see little to no effect from a Cypriot credit event – it is a small country, and the probability of a default is so high that it is likely to be already priced into the spot exchange rate. A credit event of one of the countries of the “solid core” of the euro zone, such as Germany or Austria, would have a disastrous effect on the exchange rate. These are relatively large economies and/or exhibit very low probabilities of default. The inferred depreciation of the Euro possibly reflects an expected value of a currency basket which would succeed the Euro in the case one of them defaults. The large countries of the PIIGS club are most problematic in this context. Their default is a real possibility, hence it is likely to be priced into the spot rate and thus the difference of the CDS implied exchange rate and the actual exchange rate should be rather small. Nevertheless it is likely that the Euro would struggle to absorb a credit event of one of these countries, due to the fact that these states are within the group of the largest economies of the euro zone. Consequently, the inferred exchange rate is caught in the middle between the two former groups. It is not really priced into the current exchange rate, but too likely to have such a devastating effect as a default of the core countries. Therefore, the exchange rate effect moves between the small, struggling countries and large, stable countries.

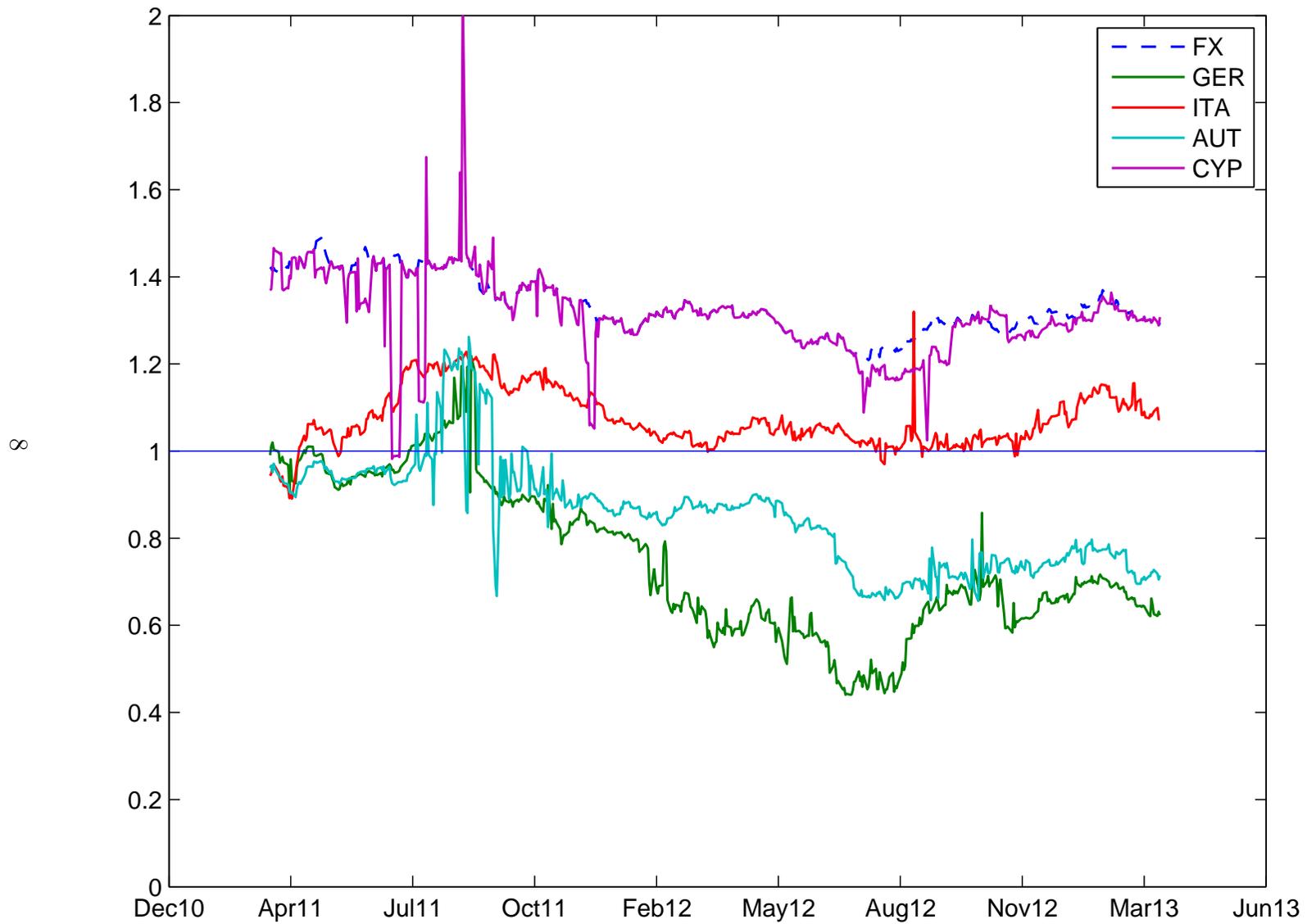


Figure 1: CDS implied exchange rates. Reading example: in August 2012, the calculations suggest that a credit event of Germany (green) would result in an immediate depreciation to around 0.50 US Cents per Euro.

References

- ARELLANO, C. (2008): “Default Risk and Income Fluctuations in Emerging Economies,” *The American Economic Review*, 98, 690 – 712.
- BREUER, A. AND O. SAUTER (2013): “The Impact of a Sovereign Default within the Euro Zone on the Exchange Rate,” *Applied Economics Quarterly*, forthcoming.
- CIFARELLI, G. AND G. PALADINO (2004): “The impact of the Argentine default on volatility co-movements in emerging bond markets,” *Emerging Markets Review*, 5, 427–446.
- FELSENHEIMER, J. (2012): “Der schwere Duft von Anarchie,” Assenagon Credit Newsletter.
- MAYORDOMO, S., J. I. PEÑA, AND E. S. SCHWARTZ (2010): “Are all credit default swaps databases equal?” NBER Working Paper Series 16590, National bureau of economic research.
- MERRICK JR., J. J. (2001): “Crisis dynamics of implied default recovery ratios: Evidence from Russia and Argentina,” *Journal of Banking and Finance*, 25, 1921–1939.
- POLLACK, L. (2011): “Quantos: when CDS met the monetary union,” ftalphaville.ft.com.