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Street View

MAY 2017

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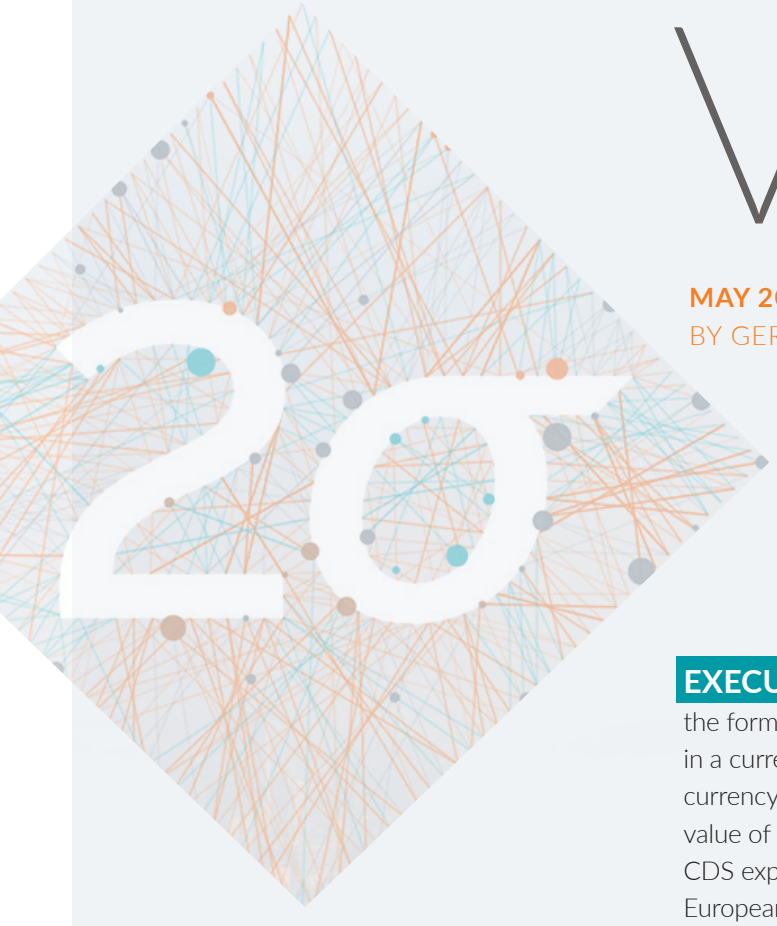

EXECUTIVE SUMMARY Protection against a sovereign default, in the form of credit default swaps (CDSs), can cost more when denominated in a currency other than the country's own. A reason for this is that currency risk is embedded within CDS prices; if a country defaults, the value of its currency is likely to drop, to the detriment of investors with CDS exposure to that currency. The recently widening gap between European sovereign CDS priced in EUR and those priced in USD may therefore herald rising distress for the European Union as a whole.

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Inside:
What Sovereign CDS Spreads Potentially Tell Us about Currency Risk

WHAT SOVEREIGN CDS SPREADS POTENTIALLY TELL US ABOUT CURRENCY RISK

The collapse of sovereign capital markets in the 1930s saw a large number of European and Latin American countries default. In 1932 the sovereign default rate recorded a maximum of about 17 percent, compared to a historical average of 2.6 percent.[1] Among other factors, the lack at that time of any security to help protect investors against a sovereign default made the experience especially panicking.

As investors may have learned from past experiences, sovereign defaults are relatively rare. Since the beginning of the 2000s, investors have increasingly bought protection against sovereign defaults, in the form of credit default swap (CDS) contracts, an insurance market that was worth $1.9tr as of 2016H1.[2]

When the European sovereign debt market started showing signs of distress in 2010 due to governments' interventions in financial markets, demand dramatically increased for CDS protection written in currencies other than the euro (Figure 1). In particular, the figure plots the difference between CDS weekly spreads written in USD and EUR for a set of 14 Western European countries from September 2010 to May 2017.[3]

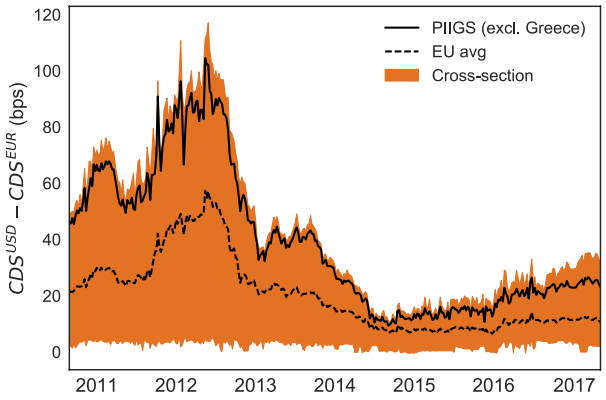
RISING EURO AND DOLLAR CDS DIFFERENTIALS: UMBRELLAS COST MORE WHEN (AND WHERE) IT'S RAINING

At the peak of the crisis in 2012, hedging in USD against the default of the PIIGS countries (Portugal, Ireland, Italy, and Spain)—but excluding Greece, a major outlier— would have cost about 100 bps more, on average, than a contract priced in EUR.

Trouble might be brewing once again. Since the end of 2014, buying protection in USD has become more expensive, as the widening orange area in Figure 1 shows. Moreover, the PIIGS (ex-Greece) countries seem to be driving this gap, as their average value lies at the top of the cross-section (black line). As point of comparison, the dashed line that plots the cross-sectional average gap for the rest of the European countries in the sample has remained relatively flat at around 10 bps.

A possible economic explanation for this differential lies in the fact that the currency value (EUR) appears strongly related to the default risk of the countries using it. Therefore, the widening trend that started in mid-2014 may signal increasing currency risk, probably associated with the risk of significant distress for the European Union as a whole.

FIGURE 1 CROSS-SECTION OF CDS^{USD} - CDS^{EUR} FOR A SET OF 14 EUROPEAN COUNTRIES



Notes: Black lines represent cross-sectional averages.
Source: Markit and authors' computations.

1 Sovereign default rates are computed as the ratio of the number of defaulted independent states and constitutions (as defined by the Comparative Constitution Projects) globally over the total number of countries in a specific year, over the period 1779 to 2016. Source: authors' computation, Comparative Constitutions Projects. See Appendix.

2 The sovereign CDS market has increased by 46% from 2007H1 to 2016H1, whereas the non-sovereign CDS market saw a drop of about 43% over the same period. Source: authors' computation and International Swaps and Derivatives Association.

3 These countries are Germany, France, Belgium, Denmark, the Netherlands, Norway, Spain, Sweden, Austria, Finland, Ireland, Italy, Portugal, and the United Kingdom. Greece is excluded because of the abnormally large spreads.

THE CURRENCY VOLATILITY RISK PREMIUM - A MEASURE OF RISK AVERSION

In support of this economic view, the gap between buying protection in USD and EUR appears to reflect investors' compensation for systematic, non-diversifiable currency risk in Europe. In other words, this compensation measures the cost of insurance against fluctuations in the currency market, capturing the degree of market risk aversion.

Academics, among others, call this phenomenon the *currency volatility risk premium* (CVRP)—a measure of how much investors are willing to spend to insure their portfolio against currency fluctuations. Della Corte, Ramadorai, and Sarno (2016) provide a model-free measure of this cost (see Appendix).

In seeking to explain such currency-related phenomena in sovereign credit markets, Table 1 reports the results of a panel regression of percentage changes in the difference of CDS priced in the two currencies on the volatility risk premium and several liquidity measures, such as market and currency depth, as well as country fixed effects (FE) (see Appendix for further explanation).

The results suggest that this currency risk persists even after controlling for the other potentially confounding factors. The negative sign of the currency volatility risk premium indicates that the difference between USD and EUR CDS spreads shrinks when currency risk is relatively cheap to buy (increasing CVRP)—i.e., when markets are pricing in less risk. Although this result appears to remain robust to the inclusion of market liquidity risk, currency liquidity risk, and country-related unobserved characteristics, most of the variation in the credit-currency gap still remains unexplained.

TABLE 1 DEP. VAR.: PERCENTAGE CHANGE IN CDS^{USD} - CDS^{EUR}

	(1)	(2)	(3)
CVRP	-4.31**	-5.94***	-5.73***
Market Depth		6.77***	5.58***
Currency Depth		0.08**	0.06
Country FE	No	No	Yes
R^2 (%)	0.1	5.6	7.0

Notes: Table 1 - Panel regression of percentage changes in CDS^{USD} - CDS^{EUR} on currency volatility risk premium (CVRP), liquidity measures, and country fixed effects. Level of significance: ***1% and **5%.

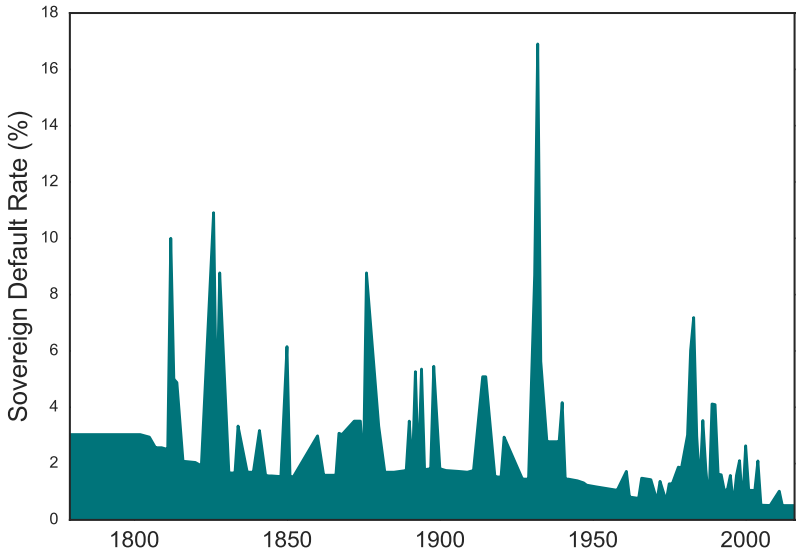
POTENTIAL IMPLICATIONS FOR INVESTORS

It is hard to say whether investors would have felt less panicked in 1932 if they had entered into insurance contracts such as credit default swaps. However, the hybrid nature of these instruments, which bundle together default and currency risk, potentially makes the overall sovereign credit market more fragile as well as more informative on the underlying currency risk.

Although credit-implied currency risk needs further exploration, investors may find it worthwhile to consider the increasing demand for foreign currency-CDS spreads in Europe as a signal of increasing currency risk and reallocate their portfolios accordingly.

APPENDIX

FIGURE 2 HISTORICAL SOVEREIGN DEFAULT RATE FROM 1779 TO 2016



Source: author's computation and Comparative Constitution Project

Variable	Methodology
Currency Volatility Risk Premium (CVRP)	Difference between expected realized volatility (ERV) and 5-year implied volatility in EURUSD. Source: Bloomberg: EURUSDV5Y.
Expected Realized Volatility (ERV)	Lagged values (previous week) of realized volatility in EURUSD using a rolling window of 252 days (annualized). Source: Bloomberg and authors' computation.
Market Depth	Weekly average number of dealers for each CDS quote. The numbers range from 2 to 25. The higher the number, the more liquid the quote. Source: Markit and authors' computation.
Currency Depth	Weekly average of the difference between number of dealers for each quote and currency. Source: Markit and authors' computation.
Country FE	Country specific Fixed Effects. Dummy variable that takes 1 for each country and 0 otherwise. It is intended to capture unobservable country specific characteristics.

REFERENCES

Della Corte, Pasquale, Tarun Ramadorai, and Lucio Sarno. "Volatility risk premia and exchange rate predictability." Journal of Financial Economics 120.1 (2016): 21-40.

INTERESTING TECHNOLOGY-RELATED ARTICLES

Two Sigma views itself as a technology company that applies a rigorous, scientific method-based approach to investment management. Our technology is inspired by a diverse set of fields including artificial intelligence and distributed computing. Occasionally, we read articles in the popular press that describe applications of technology that we find interesting, thought-provoking, and relevant for people thinking about improving the investment management process. Below is a subset of the articles we read this month. Please do not view the inclusion of these articles as an endorsement by Two Sigma of their viewpoints or the companies discussed therein. Two Sigma welcomes discussions (and contributions) about these and other such technology-related articles.

"A Large Self-Annotated Corpus for Sarcasm " by Mikhail Khodak, Nikunj Saunshi, Kiran Vodrahalli

https://arxiv.org/pdf/1704.05579.pdf

Natural language processing is an important and highly challenging branch of artificial intelligence that enables machines to interpret (and sometimes generate) spoken or written human language. Unlike most programming languages, however, "natural language" has elastic and mutable rules of grammar and syntax, and nuances like inflection, body language, and other factors can confound algorithms trying to identify meaning. Sarcasm, that peculiarly human linguistic flavoring, is a particularly hard problem for NLP algorithms to handle. Recently, however, Princeton scientists assembled a dataset of 1.3 million sarcastic statements from (shocker) Reddit.com to help NLP researchers improve algorithms' ability to make sense of snide human semantics. Called SARC (for "Self-Annotated Reddit Corpus"), the dataset is ten times larger than any previous corpora and may help pave the way for improved human-computer interaction.

"The Race To Build An AI Chip For Everything Just Got Real" by Jane C. Hu

https://www.wired.com/2017/04/race-make-ai-chips-everything-heating-fast/

As artificial intelligence continues to evolve, demand for specialized hardware is increasing, too. *Wired* recently highlighted how, in a sign of the growing prevalence of machine learning (a branch of artificial intelligence), a new generation of microprocessors purpose-built for A.I. is increasingly displacing traditional CPUs (central processing units) in massive distributed computing environments. GPUs (graphics processing units), originally made to support graphics-heavy applications like video games, have become standard equipment for running neural networks, for example. And even newer technologies, such as custom TPUs (tensor processing units), promise even greater performance and efficiency in certain machine learning applications.

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