



Street View

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EXECUTIVE SUMMARY

The most recent flare up in the Greek debt crisis seems to have had minimal effect on the global equity markets. Rolling regression results show that equity and EUR/USD prices today are half as sensitive to changes in the probability of Greek default as they were in 2009-2010. Market participants may draw one of two conclusions from these results: either that equity and currency markets have underpriced risk, or (more likely) that the market believes any contagion effect from a Greek default will be limited.

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GREEK CONTAGION

THE THEATRE OF DIONYSUS offered ancient Athenians a nearly ideal venue to watch dramatic tales unfold over multiple acts. The amphitheatre carved into the southern slope of the Acropolis could accommodate more than 17,000 spectators, many of whom came to watch the famous Greek tragedies written by Aeschylus, Sophocles, and Euripides. These stories depicted tales whose sad and sometimes horrific conclusions appeared foregone well before the denouement, yet the performance still managed to hold audiences' attentions until the end.

Modern Athens plays host to another tragedy, this one multi-authored by political leaders throughout Europe and at times watched by millions of spectators worldwide. Like its ancient predecessors, the current tragedy encompasses several acts. Yet unlike the performances in the Theatre of Dionysus, the modern audience seems to have left the building. Whereas previous acts that threatened to end in Greek default adversely dragged upon European and global equity markets as well as the euro exchange rate, the most recent dramatic flare-up in Greece seems to have had minimal effect on the market. Rolling regression results show that equity and EUR/USD prices today are half as sensitive to changes in the probability of Greek default as they were in 2009-2010. Market participants might draw one of two conclusions from those results: either equity and FX market participants naively underestimate risk from Greece, or the conclusion to a play on a Greek default no longer matters (much) to markets outside of Greece.

FIRST ACT OF THE GREEK DEBT CRISIS

One might debate the origins of the modern Greek economic tragedy, but at least one act spans the period from March 2008 until March 2012, when the Greek government triggered a default by agreeing with its major creditors - the so-called "troika" of the International Monetary Fund (IMF), European Central Bank (ECB), and the European Commission - to write down EUR 100bn of its debt. The turbulent drama during this period roiled global equity and currency markets.

The charts in the left column of Figure 1 depict this market turbulence. The charts report the coefficient (beta) of a rolling regression in which the independent variable is the change in CDS price of Greek five-year sovereign debt in USD. The dependent variable in the first row is the daily returns to the MSCI EMU index of euro zone stocks in percentage points. In July 2008, a 100 basis point increase in CDS prices led to a 5 basis point decrease for euro zone equities (not statistically significant). Over the next two years, a similarly sized move in Greek CDS prices resulted in

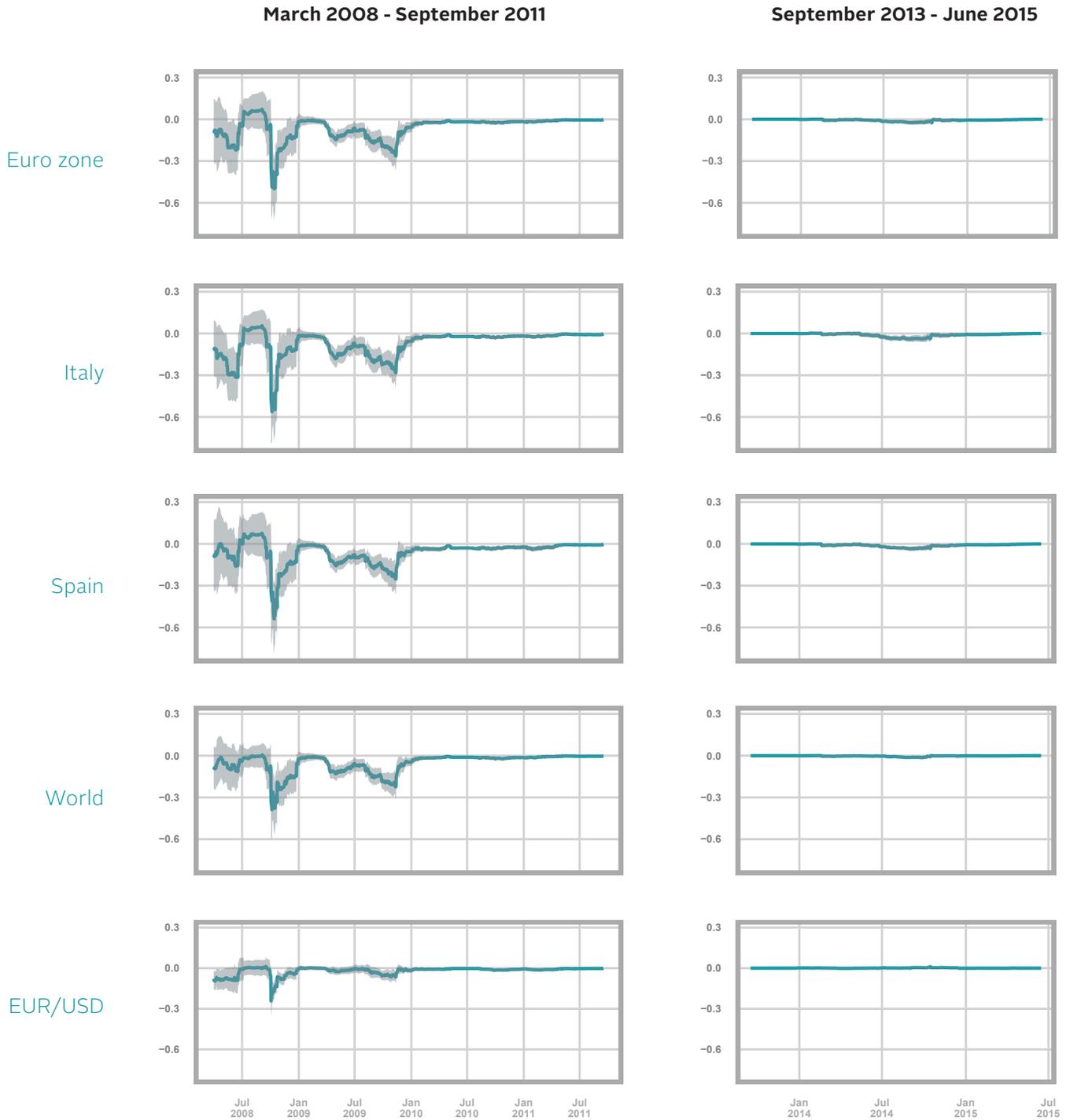
equity price declines by as much as 20 basis points (statistically significant).

For most of this "first act," the rolling beta of CDS spreads on equity returns was negative and statistically different than zero. Similar results hold for other equity markets, including Italy, Spain, and even global equities. The effect on the EUR/USD exchange rate was more muted but tended to be negative. In other words, increases in the probability of a Greek default tended to correspond to negative returns to European and global markets. Economists call this a "contagion" effect, and it might explain the willingness of European leaders and the IMF to lend money to Greece in the hopes of preventing the Greek debt crisis from infecting economies elsewhere.

SECOND (CURRENT) ACT OF THE GREEK DEBT CRISIS

The market finds itself in the midst of another act of this ongoing tragedy, but the mood has lightened.

FIGURE 1



Notes: Chart depicts the rolling (3 month) beta of a regression of daily equity returns (rows 1-4) or exchange rates (row 5) on daily changes in Greek credit default swaps for five year sovereign debt. Equity returns calculated from MSCI benchmarks (e.g., MXEM for the euro zone). Shaded regions depict 95 percent confidence intervals. Date ranges based on data availability from Bloomberg (through June 15, 2015).

The most recent act begins around June 2013, when credit default swaps on five-year Greek debt began to reappear. At the time, the market price of CDS implied an approximately 17 percent probability of a Greek default. Since then, CDS prices have doubled and the probability of a default now approaches fifty percent.¹ This act may (or may not) come to a head this month, as the Greek government and the troika appear at an impasse over terms of Greece's ongoing debt payments and further support.

Yet this act differs in an important way from the previous one. As shown in the right column of Figure 1, the rolling betas of Greek CDS prices on equity returns and the EUR/USD exchange rates have converged closer to zero. Empirically, this suggests that the doubling of the probability of a Greek default since June 2013 has had almost no effect on global equity markets. Italian and Spanish equities might represent an exception, though even those markets appear less sensitive to Greek default today than they were from 2008-2012. In other words, most non-Greek equity markets exhibit almost no fear of a Greek default.

IMPLICATIONS FOR MARKET PARTICIPANTS

Market participants may infer one of two implications from these results. The first suggests that the equity and currency markets have systematically underestimated the risk or effects of a Greek default. As a result, the markets might suddenly become more volatile as the probability of default increases over the course of June. In order to accept this implication, one would need to assume that the CDS market has accurately and rationally reflected Greek default probabilities while equity and currency markets have irrationally ignored those risks.

The second implication suggests that markets believe a Greek default no longer matters as much to the European and global economies as it once did. This might also be true if the potential contagion effects from such an event would be contained. Containment might prove feasible if other economies

are more robust today than they were during the "first act." Containment might also be more likely if the holders of Greek debt today (i.e., the troika) can better withstand the financial hit of a Greek default than the holders of Greek debt (e.g., European banks) could several years ago.

The latter explanation seems the most plausible.

Unlike the scripted stories of ancient Greek drama, no one really knows how or when this modern tale will end. We might be nearing the conclusion, or it might drag on for years to come. Either way, it would be difficult to describe the suffering of the Greek people as anything but tragic. For the rest of the world, an open question remains as to whether the seats of the theatre where this tragedy plays out will be (even partially) filled with interested parties, or just sprinkled with onlookers that have minimal financial stakes in the outcome.

¹ Implied probability of default as of June 15, 2015, based on an assumed 40 percent recovery rate. The implied probability of default based on CDS for shorter term Greek debt (e.g., 1 year) suggests a default probability closer to 100 percent.

INTERESTING TECHNOLOGY-RELATED ARTICLES

Two Sigma is a technology company that applies a rigorous, scientific method-based approach to investment management. We draw upon a diverse set of fields to inspire our technology, 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 Robot That Can Perform Brain Surgery on a Fruit Fly” by John Markoff, *The New York Times*, May 27, 2015 (<http://www.nytimes.com/2015/05/28/science/a-robot-that-can-perform-brain-surgery-on-a-fruit-fly.html>).

“On a small darkened platform a handful of fruit flies wander aimlessly. There is a brief flash of light and a robotic arm darts downward, precisely targeting a fly’s thorax, a moving target roughly the size of a pinhead.” Advances in machine vision and mechanical engineering are now trying to automate what had once been a labor-intensive, manual process of examining fruit flies for medical research. “Tasks such as determining gender, measuring the size of body parts and even performing micro-brain surgery - long performed by graduate students armed with tweezers - can now be assigned to a robot.”

“Manatee Counters Improve Their Tally” *The Wall Street Journal*, June 12, 2015 (<http://www.wsj.com/articles/manatee-counters-improve-their-tally-1434101409>).

Statistical approaches are enabling a lower cost and more accurate census of the manatee population. “Counting all wild creatures is difficult, but manatees present particular challenges. Often, they are submerged. They are nearly invisible in turbid water or choppy seas. And in warm weather, they disperse... The new method, which was executed in 2011 and 2012, used a statistical approach to account for observer error and to adjust for manatees that were outside the survey area as well as those that were present but concealed from view.” This new approach should help scientists monitor, and hopefully protect, endangered manatees.

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