The Costs of Sovereign Default: Evidence from Argentina*

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Abstract

We estimate the causal effect of sovereign default on the equity returns of Argentine firms. We identify this effect by exploiting changes in the probability of Argentine sovereign default induced by legal rulings in the case of *Republic of Argentina v. NML Capital*. Because the legal rulings affected the probability of Argentina defaulting on its debt, independent of underlying economic conditions, these rulings allow us to study the effect of default on firm performance. Using both standard event study methods and a Rigobon (2003) heteroskedasticity-based identification strategy, we find that an increase in the probability of sovereign default causes a decline in the Argentine equity market. A 1% increase in the risk-neutral probability of default causes a 0.55% fall in an index of Argentine American Depository Receipts (ADRs). Extrapolating from these estimates, we conclude that the recent Argentine sovereign default episode caused a cumulative 33% drop in the ADR index from 2011 to 2014.

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1 Introduction

A fundamental question in international macroeconomics is why governments repay their debt to foreign creditors, given the limited recourse available to those creditors. The seminal paper of Eaton and Gersovitz (1981) argues that reputational concerns alone are sufficient to ensure that sovereigns repay their debt. Because a default leads to a loss of international reputation, defaulting countries are excluded from sovereign bond markets and can no longer share risk. Eaton and Gersovitz (1981) argue that countries repay their debt to maintain their international reputation and access to credit markets. In a famous critique, Bulow and Rogoff (1989b) demonstrate that reputational contracts alone cannot be sustained in equilibrium without some other type of default cost or punishment. Following this critique, hundreds of papers have been written trying to identify these costs of default. The fundamental identification challenge is that governments usually default in response to deteriorating economic conditions, which makes it hard to determine if the default itself causes a further deterioration of the economy.

The case of *Republic of Argentina v. NML Capital* provides a natural experiment to disentangle the causal effect of sovereign default. Following Argentina's sovereign default in 2001, NML Capital, a subsidiary of Elliott Management Corporation, purchased defaulted bonds and refused to join other creditors in restructurings of the debt in 2005 and 2010. Instead, because the debt was issued under New York law, NML sued the Argentine state in US courts to receive full payment. To compel the Argentine government to repay the defaulted debt in full, the US courts blocked Argentina's ability to pay its other creditors until NML and the other holdout creditors were paid in full. The Argentine government resisted paying the holdouts in full, even though the required payments would not be particularly large relative to the Argentine economy. As a result, rulings in favor of NML raised the probability that Argentina would default on its restructured bonds, while rulings in favor of Argentina lowered this probability.

Because the court rulings were not responding to private information about the underlying economic circumstances in Argentina, we can use them to examine the effect of changing default probabilities on Argentine firms. We use credit default swaps (CDS) to measure the change in the risk neutral probability of default. Compiling rulings from the United States District Court for the Southern District of New York, the Second Court of Appeals, and United States Supreme Court, we identify sixteen rulings that potentially changed the probability of default. We find that, for every 1% increase the 5-year cumulative default prob-

ability, an index of Argentine American Depository Receipts (ADRs) falls 0.55%.[1] Between January 3, 2011, when our data starts, and July 30, 2014, when Argentina defaulted, the risk-neutral 5-year default probability increased from roughly 40% to 100%. Our estimates imply that this episode reduced the value of the Argentine firms in our index by 33%.

We begin our analysis by studying these legal rulings in an event study framework. We find economically significant negative returns for the ADRs of Argentine firms in response to legal rulings in favor of NML, and positive returns in response to rulings in favor of Argentina. We find these effects when using two-day event windows, and when using narrower windows that vary in size depending on the announcement time of the rulings. We also find that a measure of the "blue rate," the unofficial exchange rate between Argentine pesos and US dollars, depreciates in response to rulings in favor of NML and appreciates in response to rulings in favor of Argentina.

The event study approach is subject to the concern that other factors may have changed during the relevant event windows. To alleviate this concern, following Rigobon (2003) and Rigobon and Sack (2004), we identify the effect of default probability on equity returns through heteroskedasticity. We assume that on days in which US courts rule on *Republic of Argentina v. NML Capital* and related court cases, the variance of shocks to the probability of default is higher than on other days. Using this identification strategy, we find results consistent with our event study approach. We interpret our results as providing evidence that sovereign default causes economically significant harm to corporations from the defaulting country.

This paper contributes to a large literature examining the costs of sovereign default. The question of the cost of sovereign default is surveyed in Borensztein and Panizza (2008). Bocola (2013) uses a structural macroeconomic model to identify the effect of increases in sovereign risk on the performance of Italian firms. Mendoza and Yue (2011) present a general equilibrium strategic default model, building on Aguiar and Gopinath (2006) and Arellano (2008), where default is costly because it reduces the ability of domestic firms to import intermediate goods, reducing their productivity. Using a gravity model of trade, Rose (2006) argues that international trade is reduced following a sovereign default. Arteta and Hale (2008) observe that during a sovereign default, external credit to the private sector is reduced.

This paper is structured as follows: Section 2 discusses the case of *Republic of Argentina v. NML Capital*. Section 3 describes the data and presents summary statistics for the behavior of CDS and equity returns on event and non-event days. Section 4 presents our estimation framework, the identifying assumptions, and

[1] American Depository Receipts are shares in foreign firms that trade on US stock exchanges in US dollars.

our results. Section 5 presents the interpretation of the results. Section 6 concludes.

2 Argentina's Sovereign Debt Saga

2.1 The Argentine Default of 2001 and the Restructurings of 2005 and 2010

Following decades of rampant inflation, in 1991 the Argentine government adopted the "convertibility plan," introducing a currency board in an attempt to irrevocably fix the peso-dollar exchange rate at one-to-one. This meant that the government legally committed itself not to print any currency that was not backed one-to-one by a US dollar in reserves. While inflation fell following the convertibility plan, the government continued to run a deficit, largely financed through external dollar borrowing. In 2001, Argentina entered a deep recession, with unemployment reaching 14.7% in the fourth quarter.[2] In December 2001, after borrowing heavily from the IMF, Argentina defaulted on over $100 billion in external sovereign debt and devalued the exchange rate by 75%.[3]

The Argentine government then spent three years in failed negotiations with the IMF, the Paris Club, and its private creditors. In January 2005, Argentina presented a unilateral offer to its private creditors, which was accepted by the holders of $62.3 billion of the defaulted debt.[4] To strengthen its bargaining position, the Argentine legislature passed the "Lock Law," prohibiting the government from reopening the debt exchange or making any future offers on better terms.[5] After the first round of restructuring, holdout creditors were still owed $18.6 billion of principal, the Paris Club of creditors was owed $6.3 billion, and the IMF was owed $9.5 billion.[6] Despite the existence of the holdout creditors, S&P declared the end of the Argentine default in June 2005 and upgraded Argentina's long-term sovereign foreign currency credit rating to B-. In 2006, Argentina fully repaid the IMF, and Argentina reached an agreement with the Paris Club creditors in May 2014.[7]

In December 2010, Argentina offered another bond exchange to the holdout private creditors. Holdout private creditors who were owed $12.4 billion of principal agreed to the exchange. Following the exchange, on December 31, 2010, the remaining holdout creditors were owed an estimated $11.2 billion, split between

[2] Data from Global Financial Data.

[3] Daseking, Ghosh, Lane, and Thomas (2005).

[4] Hornbeck (2013).

[5] This Lock Law would feature prominently in Judge Griesa's interpretation of the *pari passu* clause, presenting evidence that holdouts were not on the same footing as the holdout creditors.

[6] Hornbeck (2013).

[7] http://www.reuters.com/article/2014/05/29/us-argentina-debt-parisclub-idUSKBN0E90JI20140529

$6.8 billion in principal and $4.4 billion in accumulated interest.[8] At this point, Argentina had restructured 91.3% of its original debt.

2.2 Argentina vs. the "Vultures"

Following the 2010 debt exchange, the remaining holdout creditors, termed "vultures" by the Argentine government, continued the legal battle. One line of attack was on the Argentine government's reserve assets, with the creditors arguing the country's reserves, held at the Federal Reserve Bank of New York, should be subject to attachment. While a district court initially agreed with the creditors, in 2011 the appellate court overturned the ruling.[9] The second line of attack, focused on the *pari passu* clause, was the one that eventually culminated in Argentina's recent default. The *pari passu* clause requires equal treatment of all bondholders. The creditors, led by NML Capital,[10] argued that the Argentine government breached this clause by paying the exchange bondholders and refusing to honor the claims of the holdouts. In addition, the holdouts asserted that the "Lock Law," by making explicit the government's policy of pledging not to re-open negotiations or pay any money, effectively subordinated them to the restructured bondholders.

The case took several years to work its way through the US courts, going from the United States District Court for the Southern District of New York ("Southern District"), to the United States Court of Appeals for the Second Circuit ("Second Circuit"), all the way to the United States Supreme Court. The numerous rulings that the three courts issued between December 2011, when Judge Thomas P. Griesa of the Southern District first ruled in favor of the holdouts on the *pari passu* issue,[11] until July 2014 when Argentina defaulted. For the purposes of this study, we view the various rulings as events that made it more or less likely that Argentina would be unable to pay the restructured bondholders, if it did not also repay the holdouts. Because of the Argentine government's unwillingness to pay the holdouts in full, rulings in favor of NML increased the probability of a default on the restructured bonds, while rulings in favor of Argentina reduced the probability of default.[12]

Following Griesa's initial ruling in December 2011, a year of legal wrangling ensued over what this

[8] Hornbeck (2013).

[9] Hornbeck (2013)

[10] Elliott Management Corporation, the parent company of NML, has a long history in litigating against defaulting countries. See Gulati and Klee (2001) for a discussion of Elliot's litigation against Peru and Panizza, Sturzenegger, and Zettelmeyer (2009) for an excellent literature review on the law and economics of sovereign default.

[11] See the decision at http://blogs.reuters.com/felix-salmon/files/2012/04/2011-12-07-Equal-Treatment-Liability-Order.pdf

[12] We use the term default to refer to a "credit event," as defined in the credit default swap contracts we study. Defaults come in many varieties, from a temporary cessation in payments to complete repudiation.

ruling actually meant and how it would be enforced. Griesa clarified that Argentina was required to repay the holdouts as long as it was continuing to the pay the exchange bondholders (using a "ratable" payment formula). Argentina was not willing to comply with this ruling, and continued to pay the exchange bondholders without paying the holdouts. Griesa then ordered the financial intermediaries facilitating Argentina's payments to stop forwarding payments to the restructured bondholders until Argentina paid the holdouts. As a result, even if Argentina wanted to pay the restructured creditors, it could not do so without repaying the holdouts, as its trustee would not be allowed to disburse the funds delivered for the coupon payment. In late 2012, Griesa ordered Argentina to negotiate with the holdouts, but the holdouts and the courts rejected Argentina's offer of a deal comparable to the 2005 and 2010 bond exchanges. Argentina then twice appealed to the Supreme Court, with the Supreme Court declining to hear either appeal. Following the decline of the second appeal on June 16, 2014, Griesa's orders were implemented, and Argentina had only two weeks before a coupon to the restructured creditors was due. Against the court orders, Argentina actually sent this coupon payment to the bond trustee, Bank of New York Mellon (BNYM), but due the court order, BNYM did not forward to the payment to the restructured bond holders. Argentina legally missed the coupon payment on June 30, which began a 30-day grace period. After negotiations failed, Argentina entered default on July 30, 2014.

2.3 A Simple Interpretation

In the simplest interpretation of the unfolding court events, Argentina was forced to default by the US court system. This was the interpretation offered by a number of commentators in the financial press.[13] Under this interpretation, Argentina could not pay its debts because the US courts forbade financial intermediaries from facilitating the coupon payment. As a result, the court rulings did nothing but change the probability of a default.

We also argue that these legal rulings do not reveal information about the underlying state of the economy (or other unobserved fundamentals), except insofar as they change the probability of default. The key assumption is that Judge Griesa (and the second circuit and Supreme Court) have no information advantage over the market with respect to the state of the Argentine economy.[14]

[13]For instance, Matt O'Brien of the Washington Post wrote "Argentina was forced to default now, because it wouldn't pay the bonds it had defaulted on in 2001" (http://www.washingtonpost.com/blogs/wonkblog/wp/2014/08/03/everything-you-need-to-know-about-argentinas-weird-default/).

[14]In the event study literature that focuses on Federal Reserve monetary policy announcements, there is some concern that the Federal Reserve has more information than market participants about the state of the economy. These sorts of concerns are unlikely

Under this interpretation, we can use credit default swaps to measure the market-implied changes in the probability of default following the court rulings. Any effect these rulings have on other variables, in particular equity returns, is caused by the change in the probability of default. By comparing these two quantities (the change in default probability and the stock return), we can estimate the effect of default on the value of the firm.

This interpretation motivates our empirical strategy. We look at the stock returns in windows around each of these events, and estimate how changes in the risk of sovereign default are related to changes in the valuation of Argentine firms. We employ several different event study techniques, which are described in detail in the next two sections. After presenting our empirical results, we will discuss alternative interpretations of the legal rulings and our results. We will also discuss several important details about the Argentine debt situation, that are relevant for the interpretation of our results.

3 Data and Summary Statistics

3.1 Stock Market and CDS Data

Our dataset consists of daily observations of financial variables from January 3, 2011 to July 29, 2014 (the day before Argentina most recently defaulted). We study the returns of US dollar-denominated ADRs issued by Argentine firms that are traded in the United States. Our primary measure of the performance of the Argentine equity market comes from the MSCI Argentina index, an index of six Argentine ADRs. As of November 28, 2014, the companies included in the index (with their index weights in parentheses), are: YPF (30.56%); Telecom Argentina (22.11%); Banco Macro (18.64%); Grupo Financiero Galicia (16.11%); BBVA Banco Frances (7.50%); and Petrobras Argentina (5.09%). In addition, we construct our own indices of ADRs covering different sectors of the Argentine economy. We classify Argentine firms by whether they are a financial firm, an industrial firm, or a real estate holding company (REIT-eligible). The industry classifications are based on Bloomberg's equity fund index classification (field "eqy_fund_ind"). We group together Bloomberg's classification of "Financial" and "Bank" into our financial index. We give equal weighting to each ADR included in our three indices. The financial index is composed of the ADRs of BBVA Banco Frances (ticker BFR); Banco Macro (BMA); and Grupo Financiero Galicia (GGAL). The industrial index is composed of Cresud (CRESY); Empresa Distribuidora y Comercializadora Norte (EDN);

to apply in this paper.

Nortel Inversora (NTL); Pampa Energia (PAM); Petrobras Argentina (PZE); Telecom Argentina (TEO); Transportador Gas Sur (TGS); and YPF (YPF). The REIT index is composed of Alto Palermo (APSA) and IRSA (IRS).

We use credit default swap (CDS) spreads to measure the market-implied risk-neutral probability of default. A CDS is a financial derivative where the seller of the swap agrees to insure the buyer against the possibility that the issuer defaults. Once a third party, generally the International Swaps and Derivatives Association (ISDA), declares a credit event, an auction occurs to determine the price of the defaulted debt. The CDS seller then pays the buyer the difference between the face and auction value of the debt. In appendix section §C, we provide details on how we impute risk-neutral default probabilities from the term structure of CDS spreads using the ISDA Standard Model. We focus on the 5-year cumulative default probability, the risk-neutral probability that Argentina defaults within 5 years of the CDS contract initiation.

Our CDS data is from Markit, a commercial data provider. We use a "sameday" CDS spread as of 9:30am EST, which we refer to as the "open," and a composite end-of-day spread, which we refer to as the "close."[15] The composite end-of-day spread is gathered over a period of several hours from various market makers, and is the spread used by those market makers to value their own trading books. The composite end-of-day spread uses updated expectations about the recovery rate[16], whereas the sameday spread is built under the assumption that the expected recovery rate has not changed from the previous day's close. Markit uses a data cleaning process to ensure that both the sameday and composite end-of-day quotes are reasonable approximations of market prices.

Because we want to capture the abnormal variation in Argentine CDS and equity returns caused by changes in the probability of default, we need to account for other global factors that may affect both measures. To proxy for global risk aversion, we use the VIX index, the 30-day implied volatility on the S&P 500.[17] We use the S&P 500 to measure global equity returns and we use the MSCI Emerging Markets Asia ETF to proxy for factors affecting emerging markets generally. We use the Asian index to ensure that movements in the index are not directly caused by fluctuations in Argentine markets. To control for aggregate credit market conditions, we use the Markit CDX High Yield and Investment Grade CDS indices.[18] Our

[15] We have also run our results with a 3:30pm "sameday" quote, instead of the composite end-of-day. Our point estimates are similar, but the standard errors are larger.

[16] Markit surveys CDS dealers at the end of each day to gather expected recovery rates.

[17] See Longstaff et. al. (2011) for discussion of VIX and variation in sovereign CDS spreads.

[18] We use the continuous on the run series from from Thomson Reuters Datastream. More information on these indices can be found at https://www.markit.com/news/Credit%20Indices%20Primer.pdf.

results are qualitatively similar when using a subset of these factors, or no controls at all.

3.2 Definition of Events and Non-Events

We build a list of legal rulings issued by Judge Griesa, the Second Circuit, and the Supreme Court. We have created this list using articles in media (the Wall Street Journal, Bloomberg News, and the Financial Times), LexisNexis searches, and publicly available information from the website of a law firm (Shearman) that practices sovereign debt law.

In appendix section §E, we list all of these events and links to the relevant source material. Unfortunately, for many of the events, we are unable to determine precisely when the ruling was issued. We employ several methods to determine the timing of rulings. First, we examine news coverage of the rulings, using Bloomberg News, the Financial Times, and LexisNexis searches. Sometimes, contemporaneous news coverage specifically mentions when the ruling was released. Second, we use the date listed in the ruling (usually next to the judge's signature). Third, many of rulings are released in the PDF electronic format, and have a "creation time" and/or "modification time" listed in the meta-information of the PDF file. In appendix section §E, we list the information used to determine the approximate time of each ruling.

For most of our analysis, we use two-day event windows. Consider the Supreme Court ruling on Monday, June 16th, 2014. The two-day event window, applied to this event, would use the CDS spread change from the close on Friday, June 13th to the close on Tuesday, June 17th. It would use stock returns from 4pm EST on Friday, June 13th to 4pm EST on Tuesday, June 17th.

For one section of our analysis, we use narrower window sizes, when possible. We classify events into several types based on when they occurred. We classify events as close-to-close, open-to-open, close-to-open, and open-to-close. For the Supreme Court ruling on June 16th, 2014, the event occurred in the morning of the 16th, after the stock market opened. In the appendix, we classify this ruling as "open-to-close" meaning that we will use the CDS spread change from 9:30am EST on Monday the 16th to roughly 4pm EST on Monday the 16th, and the stock returns from 9:30am EST on Monday the 16th to 4pm EST on Monday the 16th. If we had instead classified the event as "close-to-close," we would compare the 4pm EST close on Friday the 13th to the 4pm EST close on Monday the 16th. The "close-to-open" and "open-to-open" windows are defined in a similar way.

We choose our sample of non-events to be a set of two-day default probability changes and stock returns

(based on closes), non-overlapping, at least two days away from any event, and at least two days away from any of the "excluded events." "Excluded events" are legal rulings that we do not use, but also exclude from our sample of "non-events." For three of the legal rulings, we could not find any contemporaneous media coverage, and are therefore unable to determine when the event was known to market participants. For one legal ruling, we could not find the ruling itself, only references to it in media coverage. One of the legal rulings was issued on the Friday in October 2012 shortly before "Superstorm Sandy" hit New York, and another the night before Thanksgiving.[19] Finally, one of the legal rulings was issued at the beginning of an oral argument, in which Argentina's lawyers may have revealed information about Argentina's intentions. We exclude this day because it violates our identification assumptions. For the heteroskedasticity-based identification strategy we employ, removing these legal rulings increases the validity of our identifying assumption that the variance of shocks induced by legal rulings is higher on event days than non-event days. However, our results are robust to including these days in the set of non-events.

3.3 Summary of Events and Non-Events

In figure 1, we plot the two-day change in the 5-year default probability and the two-day return of MSCI Argentina index over our sample. Small data points in gray/light are non-events and the maroon/dark dots cover event windows in which a US court made a legal ruling regarding Argentina's debt. In most of our analysis, and in this plot, we use two-day return windows. As a result, there is some risk that other shocks occurred during the event window. In figure 1, the event labeled "1" is affected by this issue. In our analysis that uses small window sizes, this event is no longer an outlier. The details on each event can be found in Appendix A. In section §D, we present a similar figure for the different sectors of the Argentine economy, the exchange rate, and Mexican and Brazilian CDS changes and equity returns.

[Insert figure 1]

3.4 Exchange Rates

Argentina has capital controls, and its official exchange rate has diverged from the "blue market" exchange rate. One consequence of this divergence is that is very unprofitable for foreigners to purchase local Argentine stocks, because doing so would require converting their dollars to pesos at the official rate. Instead,

[19] The ruling issued the night before Thanksgiving is problematic in several ways (see the appendix for details).

foreigners who wish to invest in Argentine companies purchase ADRs. Argentine citizens can also use ADRs, as a means of circumventing capital controls. By purchasing local shares, converting them to ADRs, and then selling them in dollars in the U.S., Argentine citizens can gain access to US dollar currency without government approval (Auguste, Dominguez, Kamil, and Tesar (2006)). The convertibility of ADRs effectively establishes a shadow exchange rate. We find (in unreported results) that the implied exchange rate computed using ADR and local stock market prices does not vary significantly across firms. In our results, we report an "ADR Blue Rate," which computes the implied exchange rate for each of the six firms in the MSCI Argentina index, and weighs them using the weights described previously.[20]

There is a second way to measure the "blue market" exchange rate, which is to poll currency dealers in Argentina. For Argentine households and firms who cannot purchase dollars from the government at the official rate, and cannot execute the ADR-based currency conversion, these dealers are one way to secure dollars. Datastream, a data provider, polls these dealers and computes a "blue rate" based on their responses.

In figure 2, we show the time series of the official exchange rate, the ADR-based blue rate, and the "Onshore" blue rate computed by Datastream.

[Insert figure 2 here].

The recent divergence between the ADR-based blue rate and the onshore blue rate coincides with the rise in the default probabilities experienced by Argentina. In our empirical results, we attempt to estimate whether increases in the default probability caused the blue rate to diverge from the official rate, and whether increases in the default probability caused the ADR blue rate to diverge from the onshore blue rate. We find statistically significant evidence that increases in the default probability cause the blue rate to diverge from the official rate, immediately after a legal ruling. We do not find evidence that increases in default probability cause the ADR blue rate to diverge from the onshore blue rate.

4 Framework

Our goal is to estimate the causal effect of sovereign default on equity returns. The key identification concerns are that stock returns might have an effect on default probabilities, and that unobserved common shocks might affect both the probability of default and stock returns. In our context, one example of the

[20] To compute the ADR blue rate, we need prices for both the ADRs and the corresponding locally traded Argentine stocks. As a result, the ADR blue rate is available only on days when both markets are open. This results in smaller sample in our regressions.

former issue is that poor earnings by large Argentine firms might harm the fiscal position of the Argentine government, and therefore alter the probability of default. An example of the latter issue is a shock to the market price of risk, which could cause both CDS spreads and stock returns to change.

We consider these issues through the lens of a simultaneous equation model (following Rigobon and Sack (2004)). While our actual implementation uses multiple assets and controls for various market factors, for exposition we discuss only the market return, r_t, and the change in the risk-neutral probability of default, ΔD_t, and ignore constants.[21] The model we consider is

$$\Delta D_t = \beta r_t + \gamma F_t + \varepsilon_t \quad (1)$$

$$r_t = \alpha \Delta D_t + F_t + \eta_t \quad (2)$$

where F_t is an unobserved factor that moves both the probability of default and equity returns, ε_t is a shock to the default probability, and η_t is a shock to equity returns.[22] The goal is to estimate the parameter α, the impact of a change in the probability of default on equity market returns. If one were to simply run the regression in equation 2 using OLS, the coefficient estimate would be

$$\begin{aligned} \hat{\alpha} &= \frac{cov(\Delta D_t, r_t)}{var(\Delta D_t)} \\ &= \alpha + (1 - \alpha\beta) \frac{(\beta+\gamma)\sigma_F^2 + \beta\sigma_\eta^2}{(\beta+\gamma)^2 \sigma_F^2 + \beta^2 \sigma_\eta^2 + \sigma_\varepsilon^2} \end{aligned} \quad (3)$$

where σ_ε^2 is the variance of the default probability shock, σ_η^2 is the variance of equity return shock, and σ_F^2 is the variance of the common shock.[23] There are two sources of bias: simultaneity bias and omitted variable bias. The simultaneity bias exists if $\beta \neq 0$ and $\sigma_\eta > 0$, and omitted variable bias exists if $\gamma \neq 0$ and $\sigma_F > 0$. In order for the OLS regression to be unbiased, equity market returns must have no effect on default probabilities and there must be no omitted common shocks. These assumptions are implausible in our context, but we present this OLS regression in section 4.1 for comparison purposes.

We can rely on more plausible assumptions by adopting an event study framework (see, for instance, Kuttner (2001) or Bernanke and Kuttner (2005)). We can make the identifying assumption that changes to

[21] This is equivalent to treating abnormal returns and abnormal default probability changes as observed. Abnormal returns are the excess returns after projecting the return on to observable factors, and abnormal default probability changes are defined similarly. In our econometrics, we account for the estimator error associated with this projection when computing standard errors.

[22] We assume these shocks and unobserved factors are independent.

[23] This expression is the one presented in Rigobon and Sack (2004).

Argentina's probability of default on during the event windows (time periods in which a US court makes a ruling in the case of the *Republic of Argentina v. NML Capital*) are driven exclusively by those legal rulings, or other idiosyncratic default probability shocks (ε_t).[24] Under this assumption, we can directly estimate equation (2) using OLS on these ruling days. We will pursue this strategy in section 4.3.

Finally, we will consider a heteroskedasticity-based identification strategy, following Rigobon (2003) and Rigobon and Sack (2004). This does not require the complete absence of common and idiosyncratic shocks during event windows. This strategy instead relies on the weaker identifying assumption that the variances of the common shocks F_t and equity return shocks η_t are the same on non-event days and event days, whereas the variance of the shock to the probability of default ε_t is higher on event days than non-event days. The variance of ε_t is assumed to be higher because of the impact of the legal rulings, which are modeled as ε_t shocks under the exclusion restriction. Under this assumption, we can identify the parameter α by comparing the covariance matrices of abnormal returns and default probability changes on event days and non-event days.

In order to see how we can use this strategy to identify our key parameter of interest, we first solve for the reduced from of equations 1 and 2:

$$\begin{aligned} r_t &= \frac{1}{1-\alpha\beta}\left((\alpha\gamma+1)F_t+\eta_t+\alpha\varepsilon_t\right) \\ \Delta D_t &= \frac{1}{1-\alpha\beta}\left((\beta+\gamma)F_t+\beta\eta_t+\varepsilon_t\right) \end{aligned}$$

We can then divide all days in our sample into two types of days, event (E) and non-event (N) days. For each of the two types of days $i \in \{E,N\}$, we can estimate the covariance matrix of $[r_t, \Delta D_t]$, denoted Ω_i :

$$\Omega_i = \begin{bmatrix} var_i(r_t) & cov_i(r_t,\Delta D_t) \\ cov_i(r_t,\Delta D_t) & var_i(\Delta D_t) \end{bmatrix}$$

Calculating these moments using the reduced form equations, we can then write the covariance matrix on

[24] Rigobon and Sack (2004) demonstrate that the event study makes the identification assumption that on event days, the ratio of the default shock variance σ_ε to both the equity return shock σ_η and the common shock σ_F is infinite. If this assumption holds, we can see from equation 3 that $\hat{\alpha}$ is an unbiased estimator of α.

day type i as

$$\Omega_i = \left(\frac{1}{1-\alpha\beta}\right)^2 \begin{bmatrix} \alpha^2\sigma^2_{\varepsilon,i} + \sigma^2_\eta + \left(\alpha^2\gamma + 1\right)\sigma^2_F & \alpha\sigma^2_{\varepsilon,i} + \beta\sigma^2_\eta + \left(\alpha\gamma^2_{D,j} + \alpha\beta\gamma + \beta\right)\sigma^2_F \\ \alpha\sigma^2_{\varepsilon,i} + \beta\sigma^2_\eta + \left(\alpha\gamma + \alpha\beta\gamma + \beta\right)\sigma^2_F & \sigma^2_{\varepsilon,i} + \beta^2\sigma^2_\eta + \left(\beta^2 + \gamma\right)\sigma^2_F \end{bmatrix}$$

We can then define the difference in the covariance matrices on event and non-event days as $\Delta\Omega = \Omega_E - \Omega_N$, which simplifies to

$$\Delta\Omega \quad = \quad \lambda \begin{bmatrix} \alpha^2 & \alpha \\ \alpha & 1 \end{bmatrix} \tag{4}$$

where $\lambda = \left(\frac{\sigma^2_{\varepsilon,E} - \sigma^2_{\varepsilon,N}}{(1-\alpha\beta)^2}\right)$. This provides us with a number of ways to estimate the coefficient of interest α that we will examine in Section 4.5.

The heteroskedasticity-based approach is our preferred estimation procedure. If the identification assumptions required for the OLS or event study hold, the heteroskedasticity-based strategy will also be valid, but the converse is not true. However, the event study approach does have one advantage over the heteroskedasticity approach (as we have implemented it). For the heteroskedasticity approach, we use two-day event days, because those are the smallest uniformly-sized windows that all of our events can fit into. However, as discussed earlier, all of our events can in fact fit into smaller windows (open-close, open-open, close-open, or close-close), but those windows are not the same size for each event. Using the event study approach, we present results defined using these narrower windows. If the identification assumptions required for this event study hold, this approach may have more power than the heteroskedasticity-based approach.

We begin by presenting the OLS estimates, as point for comparison with our subsequent results.

4.1 OLS Estimates

In this section, we assume the OLS identifying assumption: $F_t = 0$ and $\beta = 0$ in equations 1 and 2 above. The model can be written as

$$r_t = \alpha\Delta D_t + \eta_t$$

where α is the coefficient of interest, and $Cov(\Delta D_t, \eta_t) = 0$. We can estimate this equation with OLS.

In our actual implementation, we include a constant and the vector of controls X_t discussed in section 3.1. We estimate the OLS model for the returns of the MSCI Argentina Index, our three ADR industry indices, and our three measures of the exchange rate.

[Insert table 1 here]

The results in table 1 imply that a 1% increase in the probability of default is is associated with a 0.46% fall in the MSCI Argentina Index. In Appendix Table A3, we see increases in the probability of an Argentine default are associated with increases in Brazilian and Mexican CDS spreads and declines in the Brazilian and Mexican equity markets. This correlation points to the importance of omitted common factors. In our heteroskedasticity-based estimates presented below and in the appendix, we show that the legal rulings have no measurable impact on Brazilian and Mexican CDS or equity markets. The method we use to construct standard errors and confidence intervals is discussed below in section 4.4. For the OLS estimates, it is essentially equivalent to heteroskedasticity-robust standard errors and confidence intervals based on first-order approximations.

4.2 Case Study: Supreme Court Announcement

We begin our discussion of the event study approach with a single event. On June 16, 2014, the U.S. Supreme Court denied two appeals and a petition from the Republic of Argentina. This denial had several effects. First, it allowed the holdouts to pursue discovery against all of Argentina's foreign assets, not just those in the United States. Second, the court declined to review Judge Griesa's interpretation of the *pari passu* clause and his orders demanding equal treatment. The denial of Argentina's petition meant that Judge Griesa could prevent the Bank of New York, the payment agent on Argentina's restructured bonds, from paying the coupons on those bonds, unless Argentina also paid the holdouts. Because Argentina had previously expressed its unwillingness to pay the holdouts, this news meant that Argentina was more likely to default.

This event is ideal for our purposes because we are able to precisely determine the time the news was released. The Supreme Court announces multiple orders in a single public session, and simultaneously provides copies of those orders to the press. Prior to releasing the official opinion, the court announces the order. SCOTUSBlog, a well-known legal website that provides news coverage and analysis of the Supreme

Court, had a "live blog" of the announcements on that day. At 9:33am EST, SCOTUSBlog reported that "Both of the Argentine bond cases have been denied. Sotomayor took no part." [25] At 10:09am, the live blog stated that Argentina's petition had been denied. At 10:11am, the live blog provided a link to the ruling.

In figure 3, we plot the returns of the Argentine ADRs, underlying equities and the percentage change in the sovereign CDS spread. The ADRs begin trading in New York at 9:30am but trading of the underlying local stocks does not begin in Argentina until 10:30am EST. To compare the returns on the underlying local stocks with the ADRs, we weight the return of the underlying stocks according to their weight in the MSCI Argentina Index of ADRs. Finally, we include 1-minute interval data on the mid-price (halfway between the bid and ask) on 5-year Republic of Argentina Senior Credit Default Swaps, from Bloomberg.[26]

[Insert figure 3 here]

From 9:30am to 10:30am, the MSCI index of ADRs fell 6% and the sameday 5-year CDS spread (measured by Markit) increased by 693 basis points (bps), implying a 9.8% increase in the risk-neutral probability of default over the next 5 years. When the Argentine stock market opened, the index of equities opened 6.2% lower than it closed the previous night. Under the standard event study assumptions, this implies that a 1% increase in the probability of default causes a 0.63% fall in ADR prices, and virtually no change in the ADR-based blue rate. In the appendix, we plot a version of the figure with each of the individual ADRs shown.

4.3 Event Study

Following the discussion in section §4, we present the results of three event studies. Each event study uses the same identification assumptions, outlined above. The first event study uses two-day windows around events. We begin by presenting summary statistics for the returns of the MSCI Argentina Index and the changes in 5-year risk-neutral default probabilities, during event windows and non-event windows.

[Insert table 2 here]

[25] See http://live.scotusblog.com/Event/Live_blog_of_orders_and_opinions__June_16_2014?Page=0

[26] We believe that the CDS data ultimately comes from the "screen" of an inter-dealer broker. It is not clear that these rates represent the actual market in the CDS. We use the Bloomberg data only for this figure, and rely on Markit data for our regressions. During the one-hour interval from 9:30am to 10:30am, the Markit sameday CDS spread increased by substantially more than the CDS spread reported by Bloomberg, although both changes are large relative to typical hourly movements.

Our event study methodology follows the one described in Campbell, Lo, and MacKinlay (1997). Let N denote the set of non-event days, and let $L1 = |N|$. We first estimate the factor model on the non-event days,

$$r_{it} = \mu_i + \gamma_i^T X_t + \varepsilon_{it},$$

and generate a time series of abnormal returns, $\hat{r}_{it} = r_{it} - \hat{u}_i - \hat{\gamma}_i^T X_t$, where X_t is the vector of controls discussed in section 3.1. We also estimate the variance of the abnormal returns associated with the factor model (assuming homoskedastic errors), $\hat{\sigma}_i^2 = \frac{1}{L1}\sum_{t\in N}\hat{\varepsilon}_{it}^2$. We next estimate a factor model for the change in the probability of default, ΔD_t, and create a time series of abnormal default probability changes, $\hat{d}_t$. We then classify our event days into three categories, based on the abnormal default probability change during the event window. Let σ_d denote the standard deviation of the abnormal default probability changes. If the probability increases by at least σ_d, we label that day as an "higher default" event. If the probability decreases by at least σ_d, we label that event as a "lower default" event. If the default probability change is less, in absolute value, than σ_d, we label that as a "no news" event.

For each type of event, we report the cumulative abnormal return and cumulative abnormal default probability change over all events of that type (higher default, lower default, no news). We also report two statistics that are described in Campbell, Lo, and MacKinlay (1997). In this event study (but not the next one we discuss), which does not aggregate returns across different ADRs, the two statistics are identical, up to a small sample size correction. Define $E_{\{h,l,n\}}$ as the set of event days of each type. The first statistic, $J1$, is computed, for event type j and ADR i, as

$$J1_{ij} = \frac{\sum_{t\in E_j}\hat{r}_{it}}{\sqrt{|E_j|\hat{\sigma}_i^2}}.$$

Under the null hypothesis that the events have no effect on the stock returns, $J1_{ij}$ is asymptotically distributed as a standard normal. However, because we have so few events in each category, asymptotic normality will be a poor approximation, if the abnormal returns are themselves far from normal. This is one reason we prefer the variance-based estimators discussed in the next section.

The second statistic, $J2$, is nearly identical to $J1$ for this event study (they will be different in the next event study we describe). For each event, we can define a standardized cumulative abnormal return,

$$z_{it} = \sqrt{\frac{|E_j|-4}{|E_j|-2}} \frac{\hat{r}_{it}}{\sqrt{\hat{\sigma}_i^2}},$$

where the first term represents a small-sample correction. The statistic $J2$ is defined as

$$J2_{ij} = \frac{\sum_{t \in E_j} z_{it}}{\sqrt{|E_j|}}.$$

This statistic is also asymptotically standard normal under the null hypothesis, subject to the same caveat about return normality. In the table 3, we present these two statistics for the MSCI Argentina Index.

[Insert table 3 here]

The results of this event study are broadly similar to the OLS estimates. In the 8 event days where the default probability significantly increased, the cumulative increase in the default probability was 44.21% and the stock market experienced a cumulative abnormal return of -18.21%. Assuming a linear relationship between default probabilities and equity returns, this implies that a 1% increase in the probability of default causes a 0.41% fall in the stock market. During the 5 days where the default probability significantly declined, the cumulative fall in the default probability was 29.48% with a cumulative abnormal return of 23.6%. This implies a 1% fall in the probability of default causes an 0.80% rise in the stock market. Treating the movements symmetrically and adding together the absolute value of the change in default probability and cumulative abnormal returns, we find that a 1% increase in the probability of default causes a 0.57% fall in the equity market. While the large window sizes used in this study raise concerns about the validity of the identification assumptions, we will see that this estimate is very close to the results we find from our heteroskedasticity-based estimates.

The next event study we present uses four different window sizes, discussed earlier. Our data set includes one additional event (17 instead of 16), because one of the two-day windows in fact contained two separate legal rulings on consecutive days. Conceptually, the event study is almost identical, except that we must study each type of event (higher default, lower default, no news) for each window size. That is, we separately estimate abnormal returns and abnormal default probability changes for each window size $s \in S$, the set of window sizes. We classify events based on the standard deviation of abnormal default probability changes

for the associated window size. Let E_{js} denote an event of type j (higher default, lower default, no news) with window size s (close-to-close, open-to-open, close-to-open, and open-to-close). The abnormal return $\hat{r}_{its}$ is the abnormal return for ADR i at time t with window size s, and $\hat{\sigma}_{is}^2$ is the variance of the abnormal returns for that window size. The $J1$ statistic is computed as

$$J1_{ij} = \frac{\sum_{s \in S} \sum_{t \in E_{js}} \hat{r}_{its}}{\sqrt{\sum_{s \in S} |E_{js}| \hat{\sigma}_{is}^2}}.$$

Asymptotically, subject to the same caveats mentioned previously, this statistic is distributed as a standard normal. The second statistic, $J2$, is constructed in a similar fashion. However, the standardized cumulative abnormal returns are now defined with respect to the event window size,

$$z_{its} = \sqrt{\frac{|E_{js}| - 4}{|E_{js}| - 2}} \frac{\hat{r}_{its}}{\sqrt{\hat{\sigma}_{is}^2}},$$

and the $J2$ statistic is

$$J2_{ij} = \frac{\sum_{s \in S} \sum_{t \in E_{js}} z_{its}}{\sqrt{\sum_{s \in S} |E_{js}|}}.$$

This statistic is also, subject to the same caveats, asymptotically standard normal. It is not the same as the $J1$ statistic, because of the heterogeneity in window size. If the cumulative abnormal returns occur mostly in shorter windows (which have smaller standard deviations), the $J2$ statistic will be larger in absolute value than the $J1$ statistic. If the reverse is true, the $J1$ statistic will be larger. The size of the window may depend in part on the court releasing the opinion, the urgency with which the opinion was required, and other endogenous factors. It is not obvious whether the $J1$ or $J2$ statistic should be preferred. Fortunately, the results presented in table 4 using the two statistics are similar.

[Insert table 4 here]

In the 5 event days where the default probability significantly increased, the cumulative probability of default rose 14.61% and the stock market had a cumulative abnormal return of -13.7%. This estimate implies that a 1% increase in the probability of default causes a 0.94% fall in equity returns. During the 5 days where the default probability significantly declined, the cumulative fall in the default probability was 32.58% with a cumulative abnormal equity return of 20.14%. This implies a 1% fall in the probability of default causes an 0.62% rise in the stock market. When we again treat up and down movements symmetrically, we find

that a 1% increase in the probability of default causes a 0.72% fall in the equity market.

Finally, we an present "IV-style" event study. This study uses the two-day events and non-events described previously. The second stage equation we wish to estimate is equation (2), discussed above. The instrument we use is $1(t \in E)\Delta D_t$ (and $1(t \in E)$), where E is the set of event days and $\mathbf{1}(\cdot)$ is the indicator function. The first-stage regression is

$$\Delta D_t = \kappa 1(t \in E)\Delta D_t + \tau 1(t \in E) + \mu_d + \gamma_d^T X_t + \omega_t,$$

where ω_t is a composite of the three unobserved shocks (ε_{it}, F_t, v_t) on the non-event days. Under the event study assumptions, the unobserved shocks ε_{it} and F_t (in the second stage) not correlated with the change in the default probability on event days.

The IV-style event study has the advantage that of offering an interpretable coefficient, $\hat{\alpha}_i$, that estimates the change in stock prices given a change in the default probability. It also takes into account the magnitude of the default probability changes on each event day, whereas the event studies discussed earlier treat each event in a category equally. However, it is not *a priori* clear that the impact of the default probability on stock returns should be linear, and therefore not obvious that this approach is superior to the two-day event study. The similarity of the two results suggests linearity is not a bad assumption. Because the IV-style event study uses two-day event windows, it requires stronger identification assumptions than the heterogenous-window event study. The standard errors and confidence intervals for this approach are described in section 4.4, below.

[Insert table 5 here]

Using this method, we find that a 1% increase in the probability of default causes a 0.55% fall in the MSCI Argentina Index, a 0.59% fall in financial stocks, a 0.33% fall in industrial stocks, and only a 3% fall in REIT-eligible stocks. While the coefficient differences are suggestive, we will defer a discussion of whether they are significantly different from one another until section 4.5. We also find that a 1% increase in the probability of default causes a 0.35% depreciation of the ADR blue rate, a 0.16% depreciation of the onshore blue rate, and has no effect on the official exchange rate.

4.4 Standard Errors and Confidence Intervals

To construct confidence intervals for our coefficient estimates, we employ the bootstrap procedure advocated by Horowitz (2001). The advantage of this procedure is that it offers "asymptotic refinements" for the coverage probabilities of tests, meaning that it is more likely to achieve the desired rejection probability under the null hypothesis. Our estimators (except for the OLS) are effectively based on a small number of the data points (the events), and therefore these refinements may provide significant improvements over first-order asymptotics. As a practical matter, our confidence intervals are in almost all cases substantially wider than those based on first-order asymptotics. Nevertheless, these "asymptotic refinements" are still based on asymptotic arguments, and there is no guarantee that they are accurate for our data. We also find (in unreported results) that our confidence intervals for our coefficient of interest, α, are similar to confidence intervals constructed under normal approximations, using a bootstrapped standard error.

We use 500 repetitions of a stratified bootstrap, resampling with replacement from our set of events and non-events, separately, so that each bootstrap replication contains 16 events and 397 non-events.[27] In each bootstrap replication, we compute the (asymptotically pivotal) t-statistic $t_k = \frac{\hat{\alpha}_k - \hat{\alpha}}{\hat{\sigma}_k}$, where $\hat{\alpha}$ is the point estimate in our actual data sample, $\hat{\alpha}_k$ is the point estimate in bootstrap replication k, and $\hat{\sigma}_k$ is the heteroskedasticity-robust standard deviation estimate from bootstrap sample k. We then determine the 2.5th percentile and 97.5th percentile of t_k in the bootstrap replications, denoted $\hat{t}_{2.5}$ and $\hat{t}_{97.5}$, respectively. The reported 95% confidence interval for $\hat{\alpha}$ is $[\hat{t}_{2.5}\hat{\sigma} + \hat{\alpha}, \hat{t}_{97.5}\hat{\sigma} + \hat{\alpha}]$, where $\hat{\sigma}$ is the heteroskedasticity-robust standard deviation estimate from our original data sample. We construct 90% and 99% confidence intervals in a similar fashion, and use them to assign asterisks in our tables.[28] In the tables, we report the 95% confidence interval and the heteroskedasticity-robust standard error from our dataset ($\hat{\sigma}$).

4.5 Variance-based Analysis

Our final set of analysis is based on the difference between the covariance matrices in equation (4). There are several potential ways to estimate α based on $\Delta\Omega$. Two such estimators, which we call the CDS-IV and Returns-IV estimators, respectively, are defined as

[27] The number of events and non-events listed apply to the ADRs. The exchange rates have a slightly different number of events and non-events, due to holidays, missing data, and related issues.

[28] These asterisks represent an "equal-tailed" test that $\alpha \neq 0$.

$$\hat{\alpha}_{CIV} = \frac{\Delta\Omega_{1,2}}{\Delta\Omega_{2,2}} = \frac{\text{cov}_E(\Delta D_t, \Delta r_t) - \text{cov}_N(\Delta D_t, \Delta r_t)}{\text{var}_E(\Delta D_t) - \text{var}_N(\Delta D_t)}$$
$$\hat{\alpha}_{RIV} = \frac{\Delta\Omega_{1,1}}{\Delta\Omega_{1,2}} = \frac{\text{var}_E(r_t) - \text{var}_N(r_t)}{\text{cov}_E(\Delta D_t, \Delta r_t) - \text{cov}_N(\Delta D_t, \Delta r_t)}$$

As shown in Rigobon and Sack (2004), these estimators can be implemented in an instrumental variables framework. More generally, equation (4) provides us with three moment conditions.

$$\Delta\Omega_{1,1} - \lambda\alpha^2 = 0, \tag{5}$$
$$\Delta\Omega_{1,2} - \lambda\alpha = 0, \tag{6}$$
$$\Delta\Omega_{2,2} - \lambda = 0. \tag{7}$$

The GMM estimator uses all three moment conditions.

The Returns-IV estimator uses an "irrelevant instrument" under the null hypothesis that $\alpha = 0$. The estimator $\hat{\alpha}_{RIV}$ is the ratio of the sample estimates of $\Delta\Omega_{1,1}$ and $\Delta\Omega_{1,2}$, both of which are zero in expectation under the null hypothesis. The denominator, $\Delta\Omega_{1,2}$, is the covariance between the default probability, which is the variable being instrumented for, and the instrument. Under the null hypothesis, this covariance is zero, meaning that the instrument is irrelevant. As a result, the behavior of the $\hat{\alpha}_{RIV}$ estimator under the null hypothesis is not characterized by the standard IV asymptotics, and our confidence intervals will not have the correct coverage probabilities. The CDS-IV estimator does not suffer from this issue. The estimator $\hat{\alpha}_{CIV}$ is based on the ratio of the sample estimates of $\Delta\Omega_{1,2}$ and $\Delta\Omega_{2,2}$. Under the null hypothesis that $\alpha = 0$ and $\lambda > 0$, the CDS-IV instrument is still relevant, and the standard asymptotics for $\hat{\alpha}_{CIV}$ apply. The GMM estimator, $\hat{\alpha}_{GMM}$, which uses all three moments, can be thought of as a geometric average of the CDS-IV and Returns-IV estimators. When $\alpha \neq 0$, using all three moments is advantageous because it takes advantage of all available information and makes over-identifying tests possible. However, under the null hypothesis that $\alpha = 0$, using the Returns-IV estimator in any way is problematic. For these reasons, we use the CDS-IV estimator as our preferred estimation procedure. We report the results for the other two methods in the appendix.

The CDS-IV instrument is relevant under the assumption that $\lambda > 0$. We formally test this assumption

using a one-sided F-test of the ratio of $(\Omega_{i,E})_{22}$ to $(\Omega_{i,N})_{22}$. We test the alternate hypothesis that this ratio is greater than 1 (implying $\lambda > 0$) against the null hypothesis that it is equal to one. In our sample, this F-statistic is 11.78, well above the 99th percentile, one-sided, bootstrapped critical value of 1.98.[29] The relevance of the CDS-IV instrument is also suggested by the weak-identification F-test of Stock and Yogo (2005) (not to be confused with the F-test for $\lambda > 0$) shown in table 6. In table 6, we present the results of our CDS-IV estimation. The standard errors and confidence intervals use the bootstrap procedure described previously.

[Insert table 6 here]

We find that increases in the 5-year risk-neutral default probability cause statistically and economically significant declines in the MSCI Argentina Index, financial ADRs, and industrial ADRs. In contrast, we do not find a statistically significant effect on the ADRs of Argentine real-estate holding companies, although we cannot rule out economically significant effects. The point estimates in table 6 are very close to those reported in table 5, with a 1% increase in the probability of default causing a 0.55% fall in the broad index, a 0.59% fall in financial stocks, a 0.32% fall in industrial stocks, and 0.006% fall in REIT-eligible stocks. Increases in the probability of default also cause significant depreciation of the blue market peso rate, measured with ADRs or by polling onshore currency dealers. However, there was no corresponding same-day change in the official exchange rate.[30] The increase in the risk-neutral default probability from 40% to 100%, which is roughly what Argentina experienced, would cause more than a 30% fall in the ADR index, by our estimates.

We formally test whether financial ADRs fall more than industrial ADRs, whether financial ADRs fall more than REIT-eligible ADRs, and whether industrial ADRs fall more than REIT-eligible ADRs. We construct these one-sided t-tests using the same bootstrap procedure for pivotal statistics discussed earlier. We find that both the financial ADRs and industrial ADRs fall more than the REIT-eligible ADRs (at the 95% confidence level), but cannot reject the hypothesis that financial and industrial ADRs respond equally to changes in the default probability.

We also test whether the blue market rates depreciate relative to the official rate, in response to increases

[29] We use the bootstrapping procedure for pivotal statistics described by Horowitz (2001), and in our section on standard errors and confidence intervals.

[30] We cannot rule out the possibility that the official exchange responds subsequently. This non-result is consistent with our identifying assumption that actions by Argentina's government, unrelated to the legal rulings, are not more likely on event days than other days.

in the default probability. We find that the difference between the onshore blue market rate and the official exchange rate is significant at the 95% level, while the difference between the ADR-based blue rate and the official rate is significant at the 90% level. We cannot rule out the hypothesis that the two blue rates respond equally to increases in the default probability.

Our results are consistent with the hypothesis that Argentina's default would cause significant harms to Argentina's economy. In the next section, we discuss the interpretation of our results.

5 Interpretation

We begin by describing an imaginary "ideal experiment" to identify the causal effect of default on economic activity. We will then discuss the ways in which our research design does and does not approach this ideal. We will offer alternative interpretations of the effect of the legal rulings, and discuss their implications for the interpretation of our results. We also discuss several additional aspects of Argentina's situation that are relevant.[31]

The ideal experiment would randomly induce one of two otherwise-identical groups of countries to default on their debt. These groups of countries would have characteristics similar to those of typical sovereign borrowers. The treatment (default) would be randomly assigned, so that it would be uncorrelated with the underlying state of the countries' economies. The treatment would induce a country to default, but would otherwise neither encourage nor impair other actions by that country's government, firms, or households. The null hypothesis in this experiment is that default does not affect economic activity. The alternative hypothesis is that default impairs economic activity, through some unspecified channel.

We emphasize the idea of "inducing" a country to default because we view default as a choice of the government. For the purposes of understanding why sovereign borrowers repay their debts, we would like to understand the consequences of them choosing not to repay. These consequences include the effects of whatever mitigating actions a country might take after having decided to default. These consequences also include the effects of firms, households, and other agents changing their behavior as a result of the default. The government's actions could include renegotiating with creditors, finding other means to borrow, balancing budgets via taxes or reduced spending, taking actions that affect the convertibility of the currency, among other actions. When we refer to the causal of effects of sovereign default, we include the anticipated

[31] Alfaro (2014) examines the implications of the legal rulings on future sovereign debt restructurings.

effects of whatever policies the government is expected to employ as a result of having defaulted.

Our research design differs from this ideal experiment in a variety of ways. First, we study Argentina, a country whose experience with sovereign debt is very different from most other countries. Argentina is in some sense in default for the entirety of our sample, depending on the definition of "default." It has an unusual currency regime. Argentina defaulted for convoluted legal reasons. Additionally, the way in which Argentina acts to mitigate the consequences of its default might be different from the way other countries would respond in similar circumstances. Second, there is the issue of whether the default is exogenous to Argentina's economic circumstances. Third, our outcome variables are not perfect measures of economic activity. Fourth, these legal rulings might have effects on firms' stock prices, through channels other than changes in the likelihood of default (the exclusion restriction may not hold). If the legal rulings compelled Argentina to repay a large amount of money, relative to its economy or foreign reserves, then firms' stock prices might fall due to the burdens of debt repayment and associated reduction in economic activity, rather than through any default-related effects.

In the reminder of this section, we will discuss each of these issues in more detail.

5.1 The Options Available to Argentina

It is not clear that Argentina was forced to default. Prior to these legal rulings, Argentina had several feasible courses of action with respect to its restructured debt and the holdouts. It could maintain the status quo, in which it was subject to attachment orders and other actions by the holdouts, while it continued to pay its restructured creditors. It could attempt to negotiate with the holdouts, and completely resolve its default. Finally, it could choose to default on its restructured creditors.

The cumulative effect of these legals rulings changed the menu of options available to Argentina. The status quo option, in which Argentina continued to pay its restructured bondholders without paying the holdouts, became infeasible.[32] Instead, Argentina could make payments on its debt, which would be divided between the restructured bondholders and the holdouts according to the "ratable payment" formula devised by Judge Griesa. Alternatively, it could attempt to negotiate with the holdouts, to avoid defaulting on its restructured bondholders. Finally, it could default on the restructured bondholders.

Argentina effectively chose the third option (default). It made a payment to the Bank of New York Mellon (BNYM), the trustee for its restructured bonds, that was sufficient to pay the restructured bondhold-

[32]This infeasibility might be temporary or permanent– it is not clear as of this writing.

ers, without paying anything to the holdouts. Judge Griesa's order prohibited BNYM from forwarding this payment to the restructured bondholders, and Argentina missed a coupon payment. After the 30-day grace period, Argentina was declared in default by the rating agencies.

As of this writing, how the situation will be resolved is unclear. One recent proposal involves replacing BNYM with another, non-U.S. trustee, who would not be subject to the U.S. courts' orders, and could continue to pay the restructured bondholders. Another complication concerns the treatment of euro-denominated bondholders, whose coupon payments are included in the amount held by BNYM. These bondholders have argued that BNYM acted contrary to Belgian and U.K. law, and that they should continue to be paid.

The cumulative effect of the legal rulings raised the probability of default on the restructured bonds and/or payment of the holdouts, relative to the probability that the status quo would continue. If Argentine firms would be affected by payment of the holdouts, holding default or no default fixed, then the exclusion restriction of our experiment would not hold.

One possibility is that the legal rulings might change the probability or size of a settlement with the holdouts, and this could affect the firms. Under the null hypothesis, if the government somehow repaid the holdouts without fiscal consequences (say, using a gift from abroad), there would be no effect on firms. In reality, because the government would need to raise taxes, cut spending, or borrow to repay the holdouts, an increase in the probability or size of a settlement with the holdouts could harm firms.

To get a sense of whether this is reasonable, we consider the extent to which the bonds owned by the holdouts appreciated, on our event days. Based on preliminary findings, we believe that the increase in the expected value of the holdout bonds is dwarfed by the cumulative losses of the Argentine firms.[33] This suggests that if, in expectation, the entirety of the burden of repayment fell on these firms, that would only explain a small part of the stock market declines. A very large "multiplier" for the loss of equity value associated with the debt burden would be required for this argument to apply.

More generally, the legal rulings could have had other effects. However, Argentine corporations are legally independent from the Argentine government, and their assets cannot be attached by the holdouts.[34] The ruling affects them only to the extent that it changes the behavior of the Argentine government or other actors. This still leaves open several possible effects. The legal rulings could have provoked the government

[33]These calculations are available upon request.

[34]There was litigation regarding whether the Argentine central bank qualified as independent from a legal perspective, but no such litigation for any of the companies listed in the stock index.

of Argentina into a sequence of actions unrelated to sovereign default. They could have influenced the probability that the current government of Argentina stays in power in the next election. The legal rulings could have changed the law regarding sovereign debt generally.

We can muster evidence against this last effect. In the appendix, section §B, we show that the stock markets and sovereign CDS spreads of Brazil and Mexico did not respond to these legal rulings (our estimates are close to zero, and relatively precise). This is in contrast to the OLS estimates, which show that those financial variables are correlated with the Argentine risk-neutral probability of default, presumably due to common shocks affecting Latin America or emerging markets more generally. This evidence suggests that, whatever changes to sovereign debt law occurred as the result of these rulings, they did not materially impact other Latin American countries that issue debt in New York.

However, we cannot rule out every possible channel through which these rulings might have affected firms, other than via sovereign default. Ex-post, it appears that the primary response of the Argentine government to these rulings was default. We are unaware of any direct consequences for Argentine firms. Consistent with this interpretation, S&P did not downgrade any Argentine firms immediately upon the sovereign's default (Standard and Poor's 2014a). However, it subsequently downgraded a variety of firms, arguing that deteriorating economic conditions reduced those firms' credit quality (Standard and Poor's 2014b).

5.2 How Much Would Argentina Have to Repay?

To meet the precise demands of the courts, Argentina needed to pay its litigating creditors only $1.5 billion. However, the $1.5 billion owed to the litigating creditors was only around 10% of the estimated $15 billion holdout debt outstanding.[35] Presumably, if Argentina paid NML and its co-litigants in full, the other holdout creditors would demand repayment on similar terms. Even if we assume that Argentina would need to pay the full $15 billion, that represented only 3% of GDP,[36] and 45% of foreign currency reserves.[37]

However, it is possible that if Argentina did indeed pay the holdouts in full, it would then owe the restructured creditors a large payment as well. During its 2004-2005 debt restructuring, Argentina sought to convince its creditors that the unilateral offer it made was the best offer they would ever receive. Argentina included a "Rights Upon Future Offers" (RUFO) clause in the bond prospectus of the restructured debt.[38]

[35] See Gelpern (2014a).

[36] The CIA World Factbook reports Argentina's 2013 GDP as $484.6 billion. However, this calculation uses the official exchange rate, which may overstate the size of Argentina's economy.

[37] The CIA World Factbook reports Argentina's foreign exchange and gold reserves at $33.65 billion as of December 31, 2013.

[38] Olivares-Caminal (2013) refers to this as the "most favored creditor clause."

The RUFO clause entitled restructuring creditors to terms at least as good as anything holdouts would receive in the future:

> Under the terms of the Pars, Discounts and Quasi-pars, if following the expiration of the Offer until December 31, 2014, Argentina voluntarily makes an offer to purchase or exchange or solicits consents to amend any Eligible Securities not tendered or accepted pursuant to the Offer, Argentina has agreed that it will take all steps necessary so that each holder of Pars, Discounts or Quasi-pars will have the right, for a period of at least 30 calendar days following the announcement of such offer, to exchange any of such holder's Pars, Discounts or Quasi-pars for the consideration in cash or in kind received in connection with such purchase or exchange offer or securities having terms substantially the same as those resulting from such amendment process, in each case in accordance with the terms and conditions of such purchases, exchange offer or amendment process.[39]

In other words, if Argentina made an offer to the holdouts that was better than what the restructured creditors received, the restructured creditors would be entitled to the better deal, provided the offer occurred before December 31, 2014. Argentina claimed that this RUFO clause meant that it could not pay NML the $1.5 billion owed without incurring hundreds of billions in additional liabilities. There is one crucial word in the RUFO that makes the whole matter more complicated: *voluntarily*. If Argentina offered the holdouts a better deal because US courts would otherwise have blocked its payments to the restructured bondholders, would that be voluntary or involuntary? Indeed, some observers noted that Argentina's counsel told the Second Circuit Court of Appeals that Argentina "would not voluntarily obey" court rulings to pay the holdouts in full.[40] In addition, other commenters noted that the RUFO appeared to have some loopholes, allowing Argentina to potentially settle with the holdouts without triggering the clause.[41] Finally, exchange bondholders could waive their right to exercise the RUFO, and because it takes 25% of exchange bondholders to trigger the clause, the whole issue could have been rendered moot if the exchange bondholders could be persuaded

[39] Full bond prospectus available at http://www.sec.gov/Archives/edgar/data/914021/000095012305000302/y04567e424b5.htm

[40] http://ftalphaville.ft.com/2013/03/06/1411442/raising-the-rufo-in-argentine-bonds/

[41] See the comment's from Barclay's reported in FT Alphaville: http://ftalphaville.ft.com/2013/03/06/1411442/raising-the-rufo-in-argentine-bonds/

that this was preferable to having their coupon payments blocked.[42] Of course, this possibility assumes Argentina would have paid any amount to the holdouts, a questionable proposition given the domestic politics surrounding the holdouts.[43]

For the purposes of interpreting our results, the RUFO clause complicates matters in two ways. First, if the RUFO clause is binding and cannot be easily circumvented, negotiation with the holdouts may not have been feasible. In this case, it would be correct to say that the legal rulings forced Argentina to default (the simple interpretation offered above). Second, if the RUFO clause was binding, but the legal rulings compelled Argentina to involuntarily pay the holdouts (and therefore circumvented the RUFO clause), they might make renegotiation feasible when it was not previously feasible. Finally, if the RUFO clause is not binding, it does not alter the interpretation of the rulings discussed above. The RUFO clause expires at the end of 2014, and events early next year may reveal whether the RUFO clause actually constrained Argentina.

5.3 Are the Legal Rulings Exogenous?

We argue that the rulings of the courts are not influenced by news about the Argentine economy. Formally, the interpretation of the laws in question does not depend on the state of the Argentine economy. Substantively, because the amount required to repay the holdouts in full was small relative to the Argentine economy, news about the Argentine economy's prospects would not materially change their ability to pay. Moreover, even if the judges were responding to economic fundamentals, under the null hypothesis that default does not affect fundamentals, the judges would have no information advantage over market participants. It follows that the effects of economic news on the judges' rulings would be anticipated by the market prior to those rulings, and any response by the market to the judges' rulings would not reflect news about fundamentals.

More subtle interactions between the state of the Argentine economy and the legal rulings might complicate the interpretation of our analysis. For example, if bad news about the Argentine economy causes the market response to the legal rulings to be larger than it otherwise would have been, our estimates will reflect some sort of average effect, where the averaging occurs over states of the economy. Relatedly, the underlying state of the economy might influence the Argentine government's decision about whether to negotiate

[42] See Gelpern (2014b).
[43] See Gelpern (2014b).

with the holdouts or default, and therefore interact with the legal rulings to determine the extent to which the default probability and stock prices change. These issues emphasize that our estimates should be considered average treatment effects, relevant to Argentina.

It is important that our event study avoid announcements by the Argentine government, because such announcements might be responding to news about fundamentals, or affect corporations in ways other than through default. In the case of the Supreme Court decision discussed earlier, the Argentine government did not respond immediately to the ruling.[44] More generally, we include as events only orders by a judge or judges. We exclude orders that were issued during oral arguments, because those events also include opportunities for lawyers representing Argentina to reveal information.

Our identifying assumption is that the variance of "legal shocks" is higher on days when a US court rules on the dispute between NML and Argentina while the variance of all other shocks remain the same. However, if in addition to shocks to economic fundamentals, and legal shocks, we imagine that there are "political shocks" which move the probability of Argentina defaulting on its debt, then it could be that the variance of these shocks are higher on event days because the government is more likely to make a pronouncement revealing how likely it is to default following a ruling by Judge Griesa.

Based on news stories, we believe that such "political shocks" are no more likely on event days than non-event days. In the future, we hope to use news stories to determine a set of dates that correspond to political shocks, and test whether such events are more likely on event days than non-event days. Even if such political events are more likely one event days, our research design is valid. In this case, we would be identifying the causal effect of the rulings on default, inclusive of both the ruling's direct effect and the Argentine government's endogenous response. Alternatively, if the political events were more likely on event days but unrelated to the issue of default, or affected firms through some mechanism other than default, our identification would fail. However, there is no apparent reason for political events to be more likely on event days, unless they are related primarily to the legal rulings.

5.4 Interpreting Stock Returns

We focus our analysis on the ADRs of Argentine firms, for several reasons. First, due to the capital controls implemented by the Argentine government, the ADRs are the primary way in which foreigners can own Argentine stocks. Second, because the ADR prices are denominated in U.S. dollars, focusing on ADRs

[44] See the following Bloomberg story: Link.

(as opposed to locally traded Argentine stocks) circumvents the problems associated with Argentina's currency regime.[45] Third, focusing on ADRs allows us to interpret our results as being related to economic fundamentals.

We view this decline in the stock price through the lens of the Campbell-Shiller decomposition. One reason ADR prices might decline is that default reduces the expected growth rate of corporate dividends, by harming the Argentine economy. Another reason that prices might decline is that higher default probabilities cause an increase in the required returns of Argentine ADRs. Because Argentina is small, relative to the world economy, and the ADRs are traded by investors in the U.S., there is no reason to expect that the legal rulings we identify alter the stochastic discount factor of the marginal investor. We also use controls for various risk factors known to predict financial market returns, to isolate the abnormal returns on Argentine ADRs that cannot be attributed to changes in the stochastic discount factor. Based on these arguments, we believe that the negative returns on Argentine ADRs associated with increases in default risk reflect reductions in expected dividend growth.[46]

Assume that the above arguments are correct, and adverse legal rulings cause reductions in expected ADR dividend growth by increasing the likelihood of default. The most straightforward interpretation of this result is that default will harm the Argentine economy, and this is what reduces expectations of dividend growth. However, there are several other possible interpretations that we cannot rule out. Default may lead to changes in the corporate share of income in Argentina, without harming the overall economy. Alternatively, the Argentine government may respond to default by increasing taxes on ADR dividends, or on the companies that happen to have ADRs. These stories, and others like them, cannot be ruled out because our outcome variable is the price of a financial asset that may not be representative of the Argentine economy.

5.5 Was Argentina Already in Default?

Although the debt exchanges of 2005 and 2010 eventually achieved a participation rate of 91.3%, above the level generally needed by a sovereign to resolve a default and reenter capital markets,[47] Argentina remained unable to borrow internationally. This is because the ongoing creditor litigation had resulted in an attachment order, which would allow the holdouts to confiscate the proceeds from a new bond issuance.[48] However,

[45] There are subtleties about how the currency regime affects dividends on ADRs, which we hope to explore in the future.

[46] Theoretically, the returns could also be caused by increases in the exposure of the ADRs to priced risk factors (an increase in "beta").

[47] Hornbeck (2013).

[48] Hornbeck (2013).

ratings agencies took a different view, and on June 1, 2005, S&P declared the end of the Argentine default and gave them a sovereign foreign currency credit rating of B-.

There are several complications arising from Argentina's ambiguous international standing. If the costs of default for Argentina were lower than that of a typical sovereign debtor, because Argentina was already unable to borrow in international markets, then our estimates understate the costs for the typical sovereign. On the other hand, because Argentina chose to default despite an ability to pay, the costs might be higher than is typical. Complicating the story further is that the Argentine government was still able to borrow in local markets, and via inter-country loans. In the aggregate, the country of Argentina was able to run a current account deficit, because its households, firms, and even local governments were able to borrow internationally, despite the inability of its federal government to do so. Therefore, even if the federal government of Argentina was in default for our entire sample, it is not clear that (as a country) it was locked out of international markets, before or after the latest default. These complications emphasize the uniqueness of Argentina's circumstances.

5.6 Relation to the Sovereign Debt Literature

In their seminal contribution, Eaton and Gersovitz (1981) argue that the reason governments repay their debt is to maintain their reputation and ensure continued access to international bond markets. Because this access allows governments to smooth income fluctuations, it is valuable and is generally sufficient to guarantee repayment.[49] English (1996) argues that the experience of US states in the 1840s provides evidence in favor of the reputational model of sovereign default by arguing that no direct sanctions were available to creditors. The Eleventh Amendment[50] prevents foreign creditors from suing US states to receive payments on defaulted debt, constitutionally guaranteed interstate free trade prevents foreign creditors from locking defaulters out of trade markets, and the US federal government prevents foreign creditors from using force to collect on the debt. English demonstrates that defaulting states are unable to borrow again for a number of years, concluding that the concern for maintaining a reputation for repayment is therefore the only explanation for continued repayment.

The recent Argentine case is in many ways the opposite of the case of these states. Because of the threat of attachment from outstanding creditors, Argentina had not issued a new international bond in thirteen

[49] Tomz (2007) provides a historical account to argue in favor of the reputational model of sovereign debt.

[50] "The judicial power of the United States shall not be construed to extend to any suit in law or equity, commenced or prosecuted against one of the United States by citizens of another state, or by citizens or subjects of any foreign state."

years and was unlikely to do so soon. In addition, because of the Argentine government's ongoing battle with creditors and its actions surrounding the 2001 default, it would be very difficult to argue that Argentina had any reputation to lose. This suggests that the effect of default that we measure is largely unrelated to reputational concerns.[51]

Instead, this points to the potential importance of two broad categories of sovereign default costs: external creditor punishments and the domestic costs of default. In ongoing work, we will use more disaggregated data on Argentine firms to look for evidence of the various channels. Here, we will limit ourselves to discussing the competing theories and the suggestive evidence from our current results, recognizing that we do not yet have the ability to distinguish between the various channels.

The most commonly proposed external punishment in the literature is exclusion from international trade markets. In their model of partial default and renegotiation, Bulow and Rogoff (1989a) assume that creditors have the ability to seize a portion of the defaulting country's exports, with the amount they can seize determining the strength of their bargaining position. Using a gravity model of international trade, Rose (2006) presents evidence that sovereign defaults cause a decline in bilateral trade of 8% per year, with a duration of fifteen years. Mendoza and Yue (2011) rationalize the observed TFP drops following a sovereign default by arguing that a default causes the country to lose access to the working capital necessary to finance imports of intermediate goods, forcing domestic firms to switch to less efficient inputs. The channel proposed in Mendoza and Yue (2011) would generate a large drop in the broad value of Argentine firms, as we observe in the data. Our empirical results show that industrial firms are more sensitive to sovereign default than real estate holding companies, a finding consistent with the importance of trade costs, as industrial firms generally produce tradables and real estate is non-tradable. However, even though this finding is consistent with a trade cost story, much more work at the firm level is needed to provide clear evidence for this channel.

Another line of research focuses on the domestic costs of sovereign default, and in particular on the effect on the domestic financial system. Gennaioli, Martin, and Rossi (2013, 2014), Bocola (2013), and Bolton and Jeanne (2011) all argue that sovereign default is harmful because it reduces financial intermediation, and this in turn negatively affects the broader economy. We find that financial firms are more vulnerable to

[51] An alternative reputational theory of sovereign debt, introduced by Grossman and Van Huyck (1988), argues that the sovereign defaults we see in equilibrium are actually part of implicit state-contingent contracts between borrowers and lenders. Lenders recognize that in bad times, it is more painful for a government to repay debts, so government defaults in these times are "excusable" and do not result in a loss of reputation. However, if a government were to default beyond the implicit state-contingency of the contract, lenders would view it as a "repudiation" resulting in a loss of reputation. One explanation through the lens of this theory is that the recent default was seen as repudiation, since Argentina was not experiencing a period of serious economic duress.

sovereign default than industrial firms or real estate holding companies, but we present no evidence that the negative effects on the broader economy are caused by the default's direct impact on the financial system. As with trade costs, to properly analyze this potential channel, we will need more disaggregated firm-level data.

6 Conclusion

For several decades, one of the most important questions in international macroeconomics has been "why do governments repay their debts?" We present evidence that a sovereign default has significant costs for domestic firms.

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7 Tables

Table 1: OLS Results

	(1) Index	(2) Financial	(3) Industrial	(4) REIT	(5) FX (ADR)	(6) FX (Onshore)	(7) FX (Official)
ΔD	-46.41***	-49.89***	-33.51***	-11.53	30.26***	11.55***	3.863
Robust SE	(6.318)	(8.111)	(5.744)	(8.023)	(4.573)	(4.019)	(1.740)
95% CI	[-60.4,-28.4]	[-65.7,-35.1]	[-47.6,-16.9]	[-28.3,6.1]	[18.3,42.8]	[3.6,19.4]	[-13.4,8.4]
Observations	413	413	413	413	368	413	413
R-squared	0.389	0.345	0.314	0.071	0.182	0.029	0.072

Notes: This table reports the results for the OLS regression of equity returns and foreign exchange (FX) rate on changes in the risk-neutral default probability (ΔD) and the covariates discussed in the text. The column headings denote the outcome variable. Index is the MSCI Argentina Index, Financial is our equally weighted index of Argentine financial ADRs, Industrial is our equally weighted index of Argentine industrial ADRs, and REIT is our equally weighted index of Argentine real estate holding companies. FX (ADR) is the ARS/USD exchange rate derived from the ratio of ADR prices (in USD) to the price of the underlying equity (in ARS). FX (Onshore) is the ARS/USD exchange rate offered by onshore currency dealers. FX (Official) is the exchange rate set by the Argentine government. The coefficient on ΔD is the effect on the percentage returns of an increase in the 5-year risk-neutral default probability from 0% to 100%, implied by the Argentine CDS curve. Standard errors and confidence intervals are computed using the stratified bootstrap procedure described in the text. The underlying data is based on the two-day event windows and non-events described in the text. Significance levels: *** p<0.01, ** p<0.05, * p<0.1.

Table 2: Summary Statistics

Day Type	Mean ΔD (%)	SD ΔD (%)	Mean Equity (%)	Equity SD (%)	Cov$(\Delta D, Equity)$	# of Days
Event	0.88	6.13	0.26	4.50	-21.26	16
Non-Event	-0.01	1.79	0.01	3.17	-2.37	397

Notes: This table reports the mean default probability change, the standard deviation of default probability changes, the mean MSCI Argentina Index return, the standard deviation of that return, and the covariance of default probability changes and that return during events and non-events. The underlying data is based on the two-day event windows and non-events described in the text.

Table 3: Standard Event Study: Index

Shock Type	# Events	CAR (%)	ΔD (%)	J_1	$P-Val\,J_1$	J_2	$P-Val\,J_2$
Higher Default	8	-18.12	44.21	-2.46**	0.0139	-2.45**	0.0143
No News	3	-2.56	-0.03	-0.57	0.5687	-0.56	0.5755
Lower Default	5	23.59	-29.48	4.05***	0.0000	4.04***	0.0000

Notes: CAR indicates cumulative abnormal return over the event windows, ΔD is the change in the risk-neutral probability of default, and the test statistics J_1 and J_2 are described in the text and in Campbell, Lo, and MacKinlay (1997), pp. 162. A shock type of higher default indicates that this event raised the default probability by more than one two-day standard deviation, a shock type of lower default indicates that this event lowered the default probability by more than one two-day standard deviation, and a shock type of no news indicates a day with a legal ruling in which the default probability did not move at least one two-day standard deviation in either direction. The underlying data is based on the two-day event windows and non-events described in the text. The p-values are the p-values for a two-sided hypothesis test assuming normality. Significance levels: *** p<0.01, ** p<0.05, * p<0.1.

Table 4: Heterogenous-Window Event Study: Index

Shock Type	# Events	CAR (%)	ΔD (%)	J_1	$P-Val\,J_1$	J_2	$P-Val\,J_2$
Higher Default	5	-13.70	14.61	-3.71***	0.0002	-3.34***	0.0008
No News	7	-5.26	4.91	-1.06	0.2891	-1.03	0.3030
Lower Default	5	20.14	-32.58	5.31***	0.0000	5.26***	0.0000

Notes: CAR indicates cumulative abnormal return over the event window, ΔD is the change in the risk-neutral probability of default, and the test statistics J_1 and J_2 are described in the text and in Campbell, Lo, and MacKinlay (1997), pp. 162. This study pools events across different window sizes (open-open, open-close, close-open, close-close). A shock type of higher default indicates that this event raised the default probability by more than one standard deviation, where the standard deviation is defined for non-events with the same window size. A shock type of lower default indicates that this event lowered the default probability by more than one standard deviation, and a shock type of no news indicates a day with a legal ruling in which the default probability did not move at least one standard deviation in either direction. The underlying data is based on the event windows and non-events described in the text, and uses the narrowest windows possible with our data and uncertainty about event times. The p-values are the p-values for a two-sided hypothesis test assuming normality. Significance levels: *** p<0.01, ** p<0.05, * p<0.1.

Table 5: IV-Style Event Study

	(1) Index	(2) Financial	(3) Industrial	(4) REIT	(5) FX (ADR)	(6) FX (Onshore)	(7) FX (Official)
ΔD	-55.18***	-59.14***	-33.38***	-3.124	35.07***	15.60***	-0.188
Robust SE	(10.84)	(13.92)	(9.829)	(13.76)	(7.577)	(6.896)	(3.000)
95% CI	[-79.3,-29.3]	[-83.7,-33.5]	[-58.8,-7.8]	[-26.9,21.7]	[14.2,58.9]	[4.9,27.1]	[-3.8,4.3]
Observations	413	413	413	413	368	413	413
1st Stage F-Stat	211.2	211.2	211.2	211.2	212.2	211.2	211.2

Notes: This table reports the results for the IV-style event study regression of equity returns and foreign exchange (FX) rate changes on changes in the risk-neutral default probability (ΔD) and the covariates discussed in the text.ΔD is instrumented for using $1(t \in E)\Delta D_t$ and $1(t \in E)$, where E is the set of event days and $\mathbf{1}(\cdot)$ is the indicator function. The column headings denote the outcome variable. Index is the MSCI Argentina Index, Financial is our equally weighted index of Argentine financial ADRs, Industrial is our equally weighted index of Argentine industrial ADRs, and REIT is our equally weighted index of Argentine real estate holding companies. FX (ADR) is the ARS/USD exchange rate derived from the ratio of ADR prices (in USD) to the price of the underlying equity (in ARS). FX (Onshore) is the ARS/USD exchange rate offered by onshore currency dealers. FX (Official) is the exchange rate set by the Argentine government. The coefficient on ΔD is the effect on the percentage returns of an increase in the 5-year risk-neutral default probability from 0% to 100%, implied by the Argentine CDS curve. Standard errors and confidence intervals are computed using the stratified bootstrap procedure described in the text. The underlying data is based on the two-day event windows and non-events described in the text. Significance levels: *** p<0.01, ** p<0.05, * p<0.1.

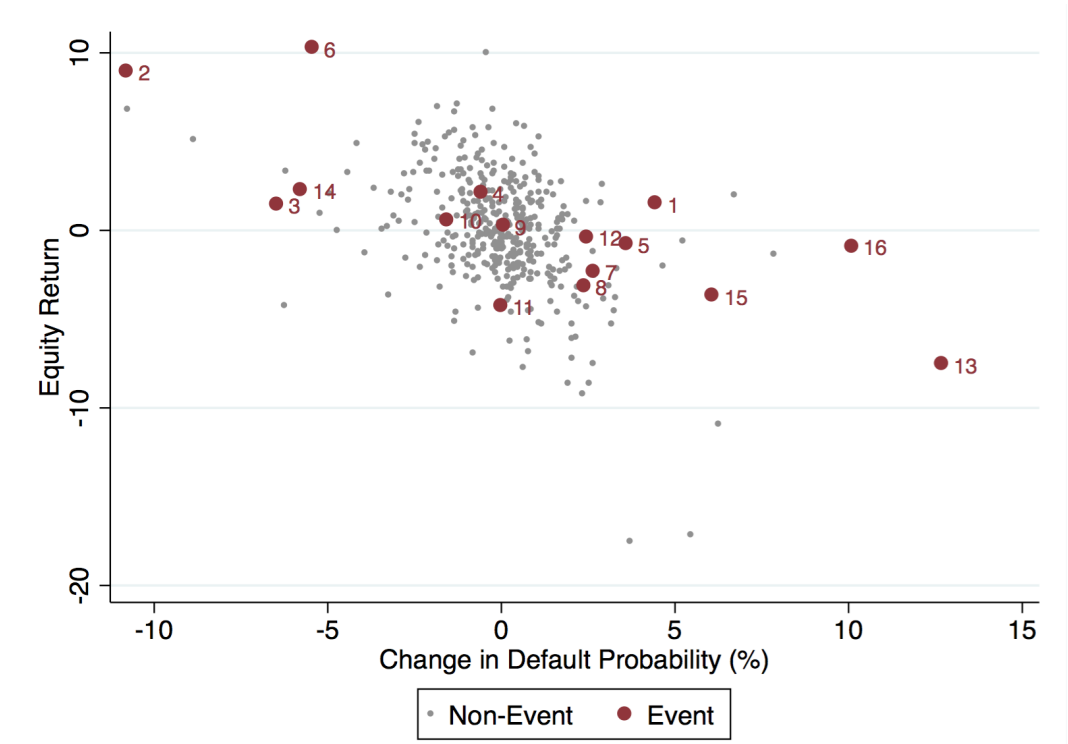
Table 6: CDS-IV

	(1) Index	(2) Financial	(3) Industrial	(4) REIT	(5) FX (ADR)	(6) FX (Onshore)	(7) FX (Official)
ΔD	-54.52***	-59.21***	-31.69**	-0.601	35.20***	16.17***	-0.579
Robust SE	(11.60)	(14.88)	(10.52)	(14.73)	(7.951)	(7.375)	(3.212)
95% CI	[-82.1,-25.8]	[-85.6,-32.4]	[-57.4,-5.4]	[-27.8,28.9]	[11.3,60.7]	[4.5,29.1]	[-2.4,5.1]
Observations	413	413	413	413	368	413	413
1st Stage F-Stat	171.9	171.9	171.9	171.9	178.7	171.9	171.9

Notes: This table reports the results for the variance-based estimator estimated as the ratio of $\lambda\alpha$ to λ. This estimator is called the "CDS-IV" estimator because it depends on the excess variance of the CDS spread on event days. The column headings denote the outcome variable. Index is the MSCI Argentina Index, Financial is our equally weighted index of Argentine financial ADRs, Industrial is our equally weighted index of Argentine industrial ADRs, and REIT is our equally weighted index of Argentine real estate holding companies. FX (ADR) is the ARS/USD exchange rate derived from the ratio of ADR prices (in USD) to the price of the underlying equity (in ARS). FX (Onshore) is the ARS/USD exchange rate offered by onshore currency dealers. FX (Official) is the exchange rate set by the Argentine government. The coefficient on ΔD is the effect on the percentage returns of an increase in the 5-year risk-neutral default probability from 0% to 100%, implied by the Argentine CDS curve. Standard errors and confidence intervals are computed using the stratified bootstrap procedure described in the text. The underlying data is based on the two-day event windows and non-events described in the text. Significance levels: *** p<0.01, ** p<0.05, * p<0.1.

8 Figures

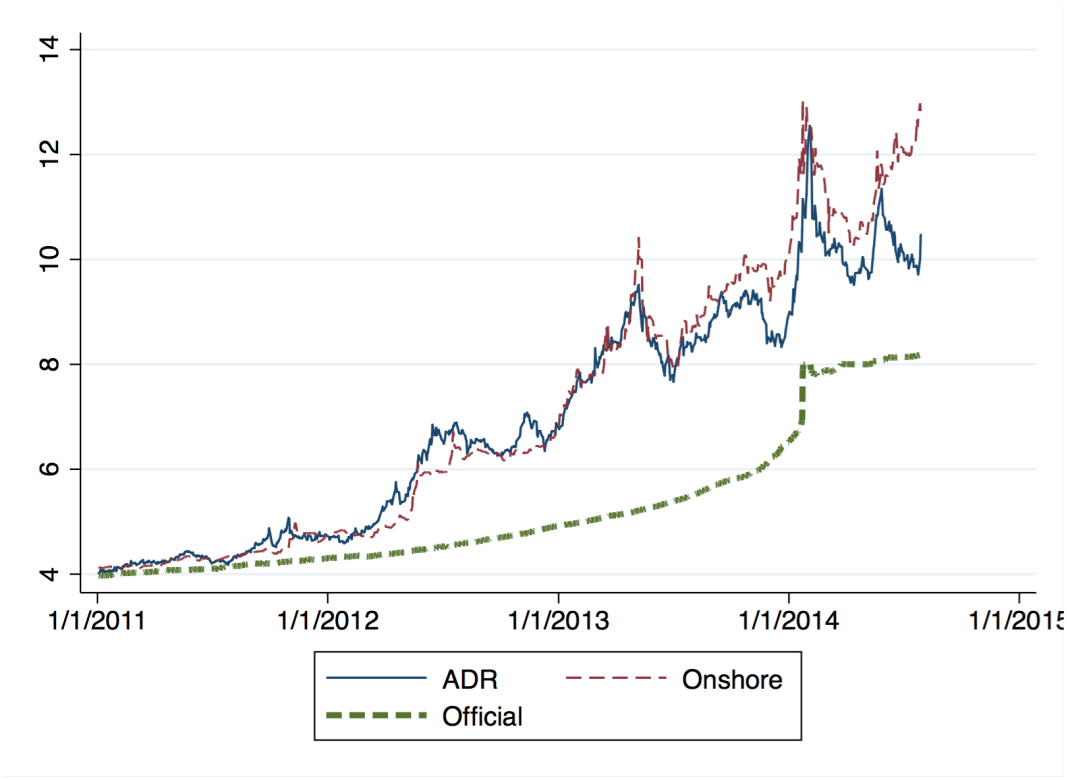
Figure 1: Default Probability Change and Equity Returns during Events and Non-Events



Event Number	Two-Day Window End Date	ΔD (%)	Equity Return (%)
1	November 27, 2012	4.47	1.49
2	November 29, 2012	-10.78	8.94
3	December 05, 2012	-6.44	1.45
4	December 07, 2012	-0.58	2.13
5	January 11, 2013	3.61	-0.78
6	March 04, 2013	-5.43	10.24
7	March 27, 2013	2.68	-2.32
8	August 26, 2013	2.39	-3.16
9	October 04, 2013	0.06	0.23
10	October 08, 2013	-1.55	0.58
11	November 19, 2013	0.01	-4.29
12	January 13, 2014	2.48	-0.39
13	June 17, 2014	12.70	-7.57
14	June 24, 2014	-5.75	2.24
15	June 27, 2014	6.10	-3.70
16	July 29, 2014	10.11	-0.91

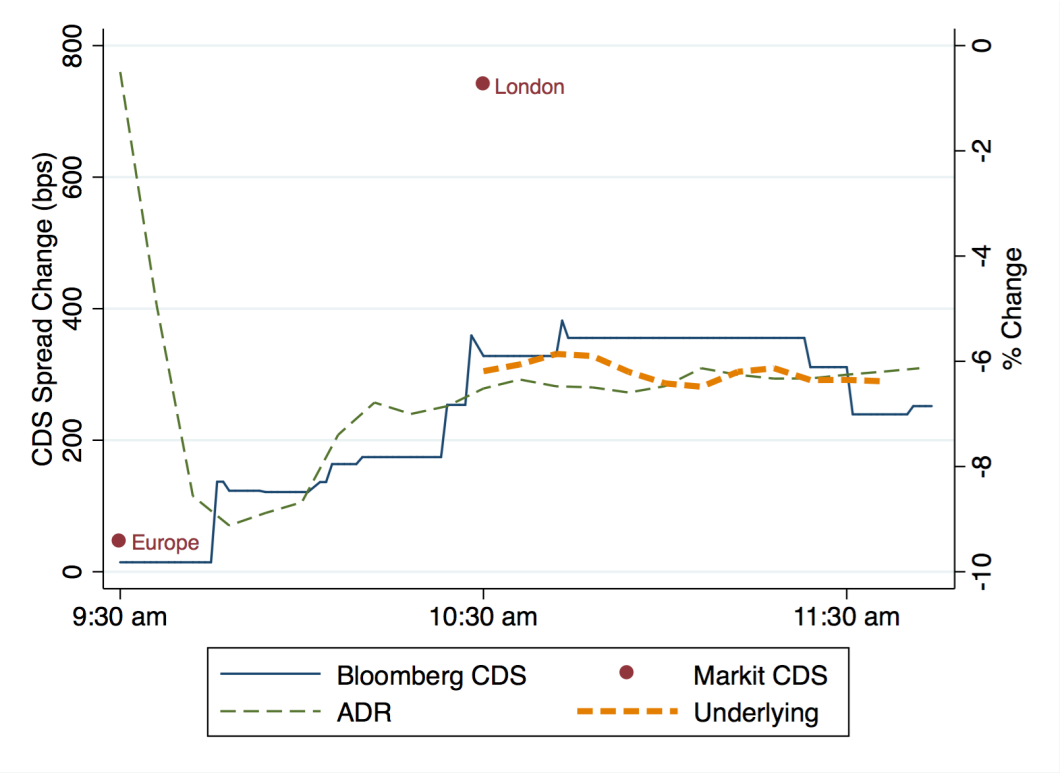
Notes: This figure plots the change in change in the risk-neutral probability of default and returns on the MSCI Argentina Index on event and non-event two-day windows. Each event and non-event day is a two-day event or non-event as described in the text. The numbers next to each maroon/dark dot references each event-day in the Table below the figure. The procedure for classifying events and non-events is described in the text.

Figure 2: Official, Onshore Blue, and ADR Exchange Rates (ARS/USD)



Notes: This figure plots the three versions of the ARS/USD exchange rate. ADR refers to the version of the "blue market" rate calculated by comparing the ADR share price in dollars with the underlying local stock price in pesos, Onshore is the exchange rate available through Argentine FX bureaus, and Official is the government's official exchange rate.

Figure 3: Event Data from June 16, 2014, 9:30-11:30am EST



Notes: This figure plots the change in the CDS spread over the previous night's close ("CDS", left axis, basis points), the change in the price of the MSCI Argentina Index against the previous night's close ("ADR", right axis, %), and the change in the price of an index of Argentine stocks with the same weightings as in the ADR based MSCI Index over the previous night's close ("Underlying", right axis, %). The Markit CDS points are labeled with the name of the reporting market, with European markets reporting at 9:30am EST and London Markets reporting at 10:30am EST.

A GMM and Returns-IV

In this section, we present results for the GMM and Returns-IV estimators discussed in the text. Given the problematic behavior of these estimators under the null hypothesis that $\alpha = 0$, we cannot interpret our bootstrapped confidence intervals as providing correct coverage for the t-tests and J-tests conducted in this section. We therefore have removed all the of asterisks from the tables, although we list the standard errors and confidence intervals generated by our procedure.

For our GMM confidence intervals, we use the moment-recentering procedure discussed by Horowitz (2001). We also employ this bootstrap strategy to estimate the 95% confidence interval for the over-identification test (J statistic). The 95% confidence interval for the J-statistic is based on the 95-th percentile of the sampling distribution, and the associated test is one-sided. Currently, we run our GMM procedure on abnormal returns/CDS changes, treating them as known. The GMM estimator is a two-step GMM estimator.

Table A1: Returns-IV

	(1) Index	(2) Financial	(3) Industrial	(4) REIT	(5) FX (ADR)	(6) FX (Onshore)	(7) FX (Official)
ΔD	-61.56	-68.53	-49.53	176.7	55.59	-9.886	499.5
Robust SE	(15.50)	(21.09)	(17.74)	(506.9)	(12.23)	(11.61)	(1,058)
95% CI	[-97.2,-12.2]	[-101.5,-31.1]	[-83.7,1.6]	[- ,500.4]	[12.9,80.6]	[-42.4,35.4]	[- ,725.2]
Observations	413	413	413	413	368	413	413
1st Stage F-Stat	81.99	71.37	48.46	0.237	64.21	59.45	0.216

Notes: This table reports the results for the variance-based estimator estimated as the ratio of $\lambda\alpha^2$ to $\lambda\alpha$. This estimator is called the "Returns-IV" estimator because it depends on the excess variance of the ADR return on event days. The column headings denote the outcome variable. Index is the MSCI Argentina Index, Financial is our equally weighted index of Argentine financial ADRs, Industrial is our equally weighted index of Argentine industrial ADRs, and REIT is our equally weighted index of Argentine real estate holding companies. FX (ADR) is the ARS/USD exchange rate derived from the ratio of ADR prices (in USD) to the price of the underlying equity (in ARS). FX (Onshore) is the ARS/USD exchange rate offered by onshore currency dealers. FX (Official) is the exchange rate set by the Argentine government. The coefficient on ΔD is the effect on the percentage returns of an increase in the 5-year risk-neutral default probability from 0% to 100%, implied by the Argentine CDS curve. Standard errors and confidence intervals are computed using the stratified bootstrap procedure described in the text. The underlying data is based on the two-day event windows and non-events described in the text.

Table A2: GMM

	(1) Index	(2) Financial	(3) Industrial	(4) REIT	(5) FX (ADR)	(6) FX (Onshore)	(7) FX (Official)
α (ΔD)	-54.45	-60.09	-34.23	-0.466	40.82	17.87	-0.166
Robust SE	(14.05)	(14.16)	(17.42)	(14.58)	(21.24)	(4.218)	(0.851)
95% CI	[-100.3,-5.0]	[-100.2,-32.8]	[-81.8,35.2]	[-65.8,35.9]	[-50.6,124.3]	[1.2,29.3]	[-2.5,1.5]
λ	30.04	30.55	25.21	33.05	21.39	50.85	33.60
Robust SE	(13.21)	(13.64)	(12.32)	(13.02)	(10.44)	(11.66)	(14.17)
95% CI	[-63.9,56.2]	[-41.3,56.2]	[-228.9,53.4]	[-664.5,57.5]	[-107.1,54.1]	[3.1,69.3]	[- , 48.7]
Observations	413	413	413	413	368	413	413
J-Stat	0.180	0.280	0.864	0.0207	1.160	5.521	0.872
J-Stat-CI	[0,6.5]	[0,4.5]	[0,4.8]	[0,8.4]	[0,15.3]	[0,2.8]	[0,31.6]

Notes: The GMM estimates are based on a two-step estimator, run once for each outcome variable. The column headings denote the outcome variable. Index is the MSCI Argentina Index, Financial is our equally weighted index of Argentine financial ADRs, Industrial is our equally weighted index of Argentine industrial ADRs, and REIT is our equally weighted index of Argentine real estate holding companies. FX (ADR) is the ARS/USD exchange rate derived from the ratio of ADR prices (in USD) to the price of the underlying equity (in ARS). FX (Onshore) is the ARS/USD exchange rate offered by onshore currency dealers. FX (Official) is the exchange rate set by the Argentine government. The parameter α is the effect on the percentage returns of an increase in the probability of default, from 0% to 100%. λ is proportional to the difference in the variance of the default probability shocks during event and non-event windows. Standard errors and confidence intervals are computed using the stratified bootstrap procedure described in the text, with moment recentering. J-Stat is an overidentification test of the validity of the assumptions described in Rigobon and Sack (2004). The underlying data is based on the two-day event windows and non-events described in the text.

B Mexico and Brazil

Table A3: Regressions for Brazil and Mexico

	(1) Brazil CDS	(2) Brazil Index	(3) Mexico CDS	(4) Mexico Index
OLS ΔD	53.08***	-12.21***	42.75***	-5.978**
Robust SE	(8.632)	(3.823)	(7.861)	(3.150)
95% CI	[30.53,76.38]	[-18.40,-6.50]	[20.43,67.46]	[-11.18,-0.98]
Event IVΔD	23.16**	-3.035	6.330	0.634
Robust SE	(15.22)	(6.592)	(13.98)	(5.426)
95% CI	[1.14,53.00]	[-15.04,9.30]	[-25.62,48.25]	[-4.14,7.93]
CDS-IVΔD	20.68	-1.098	1.728	1.669
Robust SE	(16.44)	(7.075)	(15.09)	(5.812)
95% CI	[-4.28,54.10]	[-9.84,10.18]	[-33.83,48.53]	[-3.22,8.73]

Notes: This table reports the results for the OLS, IV-style event study, and CDS-IV estimators of the effect of changes in the risk-neutral default probability (ΔD) on the 5-year CDS spreads and stock market indices of Brazil and Mexico. The coefficient on ΔD is the effect on the percentage returns (of stocks) and change in the 5-year CDS spread (in bps) of an increase in the 5-year risk-neutral default probability from 0% to 100%, implied by the Argentine CDS curve. Standard errors and confidence intervals are computed using the stratified bootstrap procedure described in the text. The underlying data is based on the two-day event windows and non-events described in the text. Significance levels: *** p<0.01, ** p<0.05, * p<0.1.

C Risk-Neutral Default Probabilities

We convert CDS spreads into risk-neutral default probabilities to provide a clearer sense of the magnitude of the estimated coefficients. We emphasize that we work with risk-neutral probabilities and do not attempt to convert them to physical probabilities. Pan and Singleton (2008) and Longstaff, Pan, Pedersen, and Singleton (2011) impose additional structure to estimate the physical default probabilities.

We begin with data from Markit on CDS par spreads. The par spread is the coupon payment that a buyer of CDS protections pays to the seller of the contract such that the CDS contract has zero cost at initiation. Because the seller of a CDS insures the buyer of a CDS against credit losses throughout the duration of the contract, pricing the contract involves calculating the term structure of credit risk on the bond.

The market standard for pricing CDS is a reduced form model that models time-varying credit risk as a time-varying hazard rate of default. [52] The simplest version of such a model would be to assume that throughout the life of CDS contract there is a constant default hazard rate λ. In this simple case, we can convert the par spread S_T for a contract with maturity T to the hazard rate,

$$\lambda = \frac{S_T}{1 - Recov.} \tag{A8}$$

where *Recov.* is the recovery rate, which is assumed to be known and constant. Once this hazard rate λ is calculated, we can calculate the probability that a bond defaults before time $t = T$ as

$$Pr(Def < T) = 1 - \exp(-\lambda T).$$

For example, a 1-year CDS with zero recovery and a par spread of 100% would imply a hazard rate of 1. This means that half the time the bond would fully default and the seller would fully compensate the buyer, and half the time the underlying bond would not default and the seller would earn an annual interest rate of 100%, breaking even on average.

If there were only one tenor of CDS observed in the market, this constant hazard rate calculation would be all that is feasible. However, with the multiple tenors we do not need to restrict the hazard function λ to be constant throughout the duration of the CDS. Our dataset includes quotes at the 6 month, 1 year, 2 year, 3 year, 4 year, 5 year, 7 year, 10 year, 15 year, 20 year and 30 year tenors. We follow the ISDA standard and

[52] White (2013) provides a very thorough discussion of the ISDA standard model.

construct the risk-free yield curve using the Libor deposit rate for the 6 month tenor and interest rate swap rate for all longer maturities. This data can be downloaded from FRED, the online database of the Federal Reserve Bank of St. Louis.

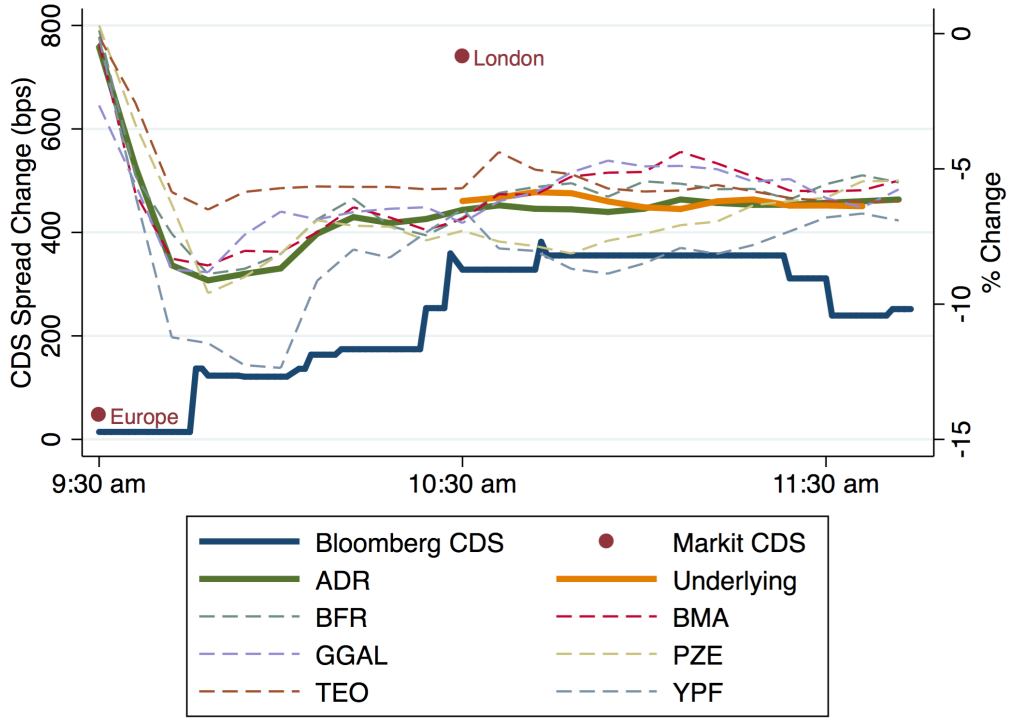
We implement the standard market model in Matlab using *cdsbootstrap.* The assumption of the standard model is that the time varying hazard rate $\lambda(t)$ is constant between all of the nodes of the CDS curve. This mean that we begin by using A8 to calculate λ_{6m}, the hazard rate between the initiation of the contract and its expiration 6 months later. We use the recovery rate that Markit calculates by polling the reporting dealers as our assumed recovery upon default. This recovery rate is assumed to be the same for all tenors. Having calculated $\lambda_{6M,}$ we can calculate λ_{1Y}, the hazard rate between 6 months and 1 year of the contract consistent with the observed par spread, then λ_{2Y} between 1 and 2 years, and so on up the curve. Having calculated these hazard rates, we can then compute the probability of a default during the life of each contract as:

$$\begin{aligned}
Pr(D \leq 6M) &= 1 - \exp\left(-\lambda_{6M} \cdot \left(\frac{1}{2}\right)\right) \\
Pr(D \leq 1Y) &= 1 - \exp\left(-\lambda_{6M} \cdot \left(\frac{1}{2}\right) - \lambda_{1Y} \cdot \left(\frac{1}{2}\right)\right) \\
&\vdots \\
Pr(D \leq 5Y) &= 1 - \exp\left(-\lambda_{6M} \cdot \left(\frac{1}{2}\right) - \lambda_{1Y} \cdot \left(\frac{1}{2}\right) - \lambda_{2Y} - \lambda_{3Y} - \lambda_{4Y} - \lambda_{5Y}\right)
\end{aligned}$$

We perform this bootstrapping for our 11 tenors for the full sample period (January 3, 2011 to July 30, 2014).

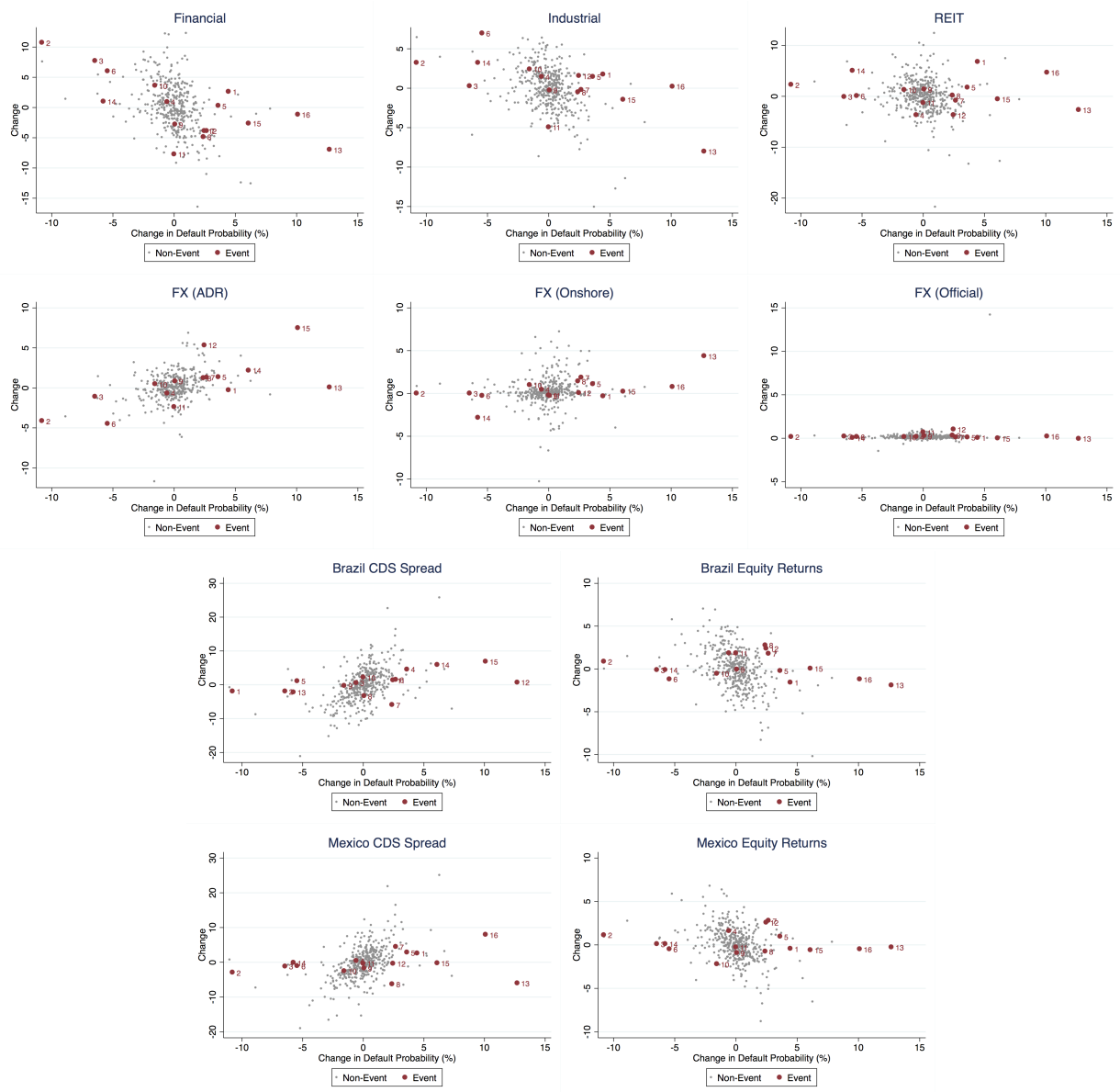
D Figures

Figure A1: Event Data from June 16, 2014, 9:30-11:30am EST



Notes: This figure plots the change in the CDS spread over the previous night's close ("CDS", left axis, basis points), the change in the price of the MSCI Argentina index against the previous night's close ("ADR", right axis, %), and the change in the price of an index of Argentine stocks with the same weightings as in the ADR based MSCI Index over the previous night's close ("Underlying", right axis, %). The dashed lines indicate the change in the price of the individual ADRs in the MSCI Argentina Index against the previous night's close, all plotted on the right axis. BFR is the ticker for BBVA Banco Frances, BMA denotes Banco Macro, GGAL denotes Grupo Financiero Galicia, PZE denotes Petrobras Argentina, TEO denotes Telecom Argentina, and YPF denotes YPF. The Markit CDS points are labeled with the name of the reporting market, with European markets reporting at 9:30am EST and London Markets reporting at 10:30am EST.

Figure A2: Change in Default Probability and other Financial Variables on Event and Non-Event Days



Notes: This figure plots the change in the risk-neutral probability of default and returns on all indices and exchange rates, as well as Mexican and Brazilian equities and CDS, on event and non-vent days. Each event and non-event day is a two-day event or non-event as described in the text. The numbers next to each maroon dot references each event-day in the table below Figure 1. The procedure for classifying events and non-events is described in the text.

E Event and Excluded Dates

Two-Day Window End	Event Type	Description	PDF Time (EST)	Decision Link	News Time (EST)	News Link	Comments
7Dec11	Excluded	Original ruling by Judge Griesa with regards to Pari Passu clause.	7Dec11, 12:55pm	Decision	Missing	Missing	There was very little contemporaneous news coverage, and we are unable to determine when the ruling became public. The first story we found about the ruling is based on an article in "La Nacion" published on 5Mar12.
23Feb12	Excluded	Order by Judge Griesa requiring "ratable payment."	Missing	Order	Missing	Missing	See above.
05Mar12	Excluded	Stay granted by Judge Griesa, pending appeal.	Missing	Stay	05Mar12, 7:11am	Bloomberg	See above.
26Oct12	Excluded	Appeals court upholds Judge Griesa's ruling that the Pari Passu clause requires equal treatment of restructured bondholders and holdouts.	25Oct12, 12:43pm	Decision	26Oct12, 2:14pm	Bloomberg	The appeals court releases opinions during the middle of the day. Unfortunately, the closing marks on this day are questionable, given the impending impact of "Superstorm Sandy."
23Nov12	Excluded	Judge Griesa removes the stay on his order that Argentina immediately pay the holdouts, if they also pay the exchange bondholders.	Missing	Order	22Nov12, 5:33am.	Business News Americas	Nov 22 was Thanksgiving in the United States, and all CDS marks on that date and the morning of the 23rd appear to be the same as on the 21st. The opinion was filed by Judge Griesa on the night of the 21st, but was embargoed until the 23rd. On the 22nd, the Argentine market fell a lot, but bounced back on the 23rd. We cannot observe this in the ADR data, so we exclude this event.

Two-Day Window End	Event Type	Description	PDF Time (EST)	Decision Link	News Time (EST)	News Link	Comments
27Nov12	Open-to-Open, 26Nov12 to 27Nov12	Judge Griesa denies the exchange bondholders request for a stay. The bondholders immediately appealed.	26Nov12, 3:43pm	Denial	27Nov12, 5:00am.	New York Post	The denial occurred on the 26th, and both the government of Argentina and the exchange bondholders immediately appealed. We compare the open on the 27th to the open on the 26th. The 26th is an Argentine holiday, so the ADR Blue Rate is missing. For the two day window, we use the close on the 26th to the close on the 28th, because of the issues with the close on the 23rd.
29Nov12	Close-to-Open, 28Nov12 to 29Nov12	Appeals court grants emergency stay of Judge Griesa's order.	28Nov12, 5:04pm[53]	Stay	29Nov12, 8:24am.	Bloomberg	
05Dec12	Open-to-Close, 04Dec12	Appeals court denies request of holdouts to force Argentina to post security against the payments owed.	04Dec12, 1:15pm.[54]	Denial	04Dec12, 1:46pm.	Bloomberg	
07Dec12	Close-to-Close, 05Dec12 to 06Dec12	Appeals court allows the Bank of New York (custodian of the exchange bonds) and the Euro bondholders to appear as interested parties.	05Dec12, 10:13pm.	Order	06Dec12, 11:47am	Bloomberg	
11Jan13	Close-to-Open, 10Jan13 to 11Jan13	Appeals court denies certification for exchange bondholders to appeal to NY state court for interpretation on Pari Passu clause.	10Jan13, 4:10pm	Order	11Jan13, 12:01am	Bloomberg	The ruling was written immediately after the closes on the 10th.

[53]This order has a 9pm "creation time" and a 5pm "modification time."
[54]This "creation time" of this PDF is actually at 4pm, 3 hours after the "modification time".

Two-Day Window End	Event Type	Description	PDF Time (EST)	Decision Link	News Time (EST)	News Link	Comments
28Feb13	Excluded	Appeals court denies request for en-banc hearing of appeal.	28Feb13, 3:27pm.	Decision	Missing	Shearman	The denial occurred at the beginning of a hearing, during which lawyers for both sides argued various issues. Lawyers from Argentina may have changed their arguments in response to expectations about the Argentine economy, violating the exclusion restriction.
04Mar13	Open-to-Open, 01Mar13 to 04Mar13	Appeals court asked Argentina for a payment formula.	01Mar13, 11:49am.	Order	01Mar13, 4:46pm	Financial Times	The FT story is the earliest we could find. Most other coverage is from the following day (a Saturday).
27Mar13	Open-to-Open, 27Mar13 to 26Mar13	Appeals court denies Argentina's request for en-banc rehearing.	26Mar13, 11:58am	Order	26Mar13, 2:35pm	Bloomberg	The Bloomberg story specifically mentions a 374bp increase in the 5yr CDS spread, which does not appear in our data until after the NY close at 3:30pm. We use the one day window to ensure we are capturing the event.
01Apr13	Non-Event (neither event or excluded)	Argentina files payment plan. Offer roughly 1/6 of Judge Griesa ordered.	N/A	N/A	30Mar13, 12:05pm	Bloomberg	Argentina filed just before midnight on 28Mar13. Actions by Argentina are endogenous. This neither an event nor excluded.
22Apr13	Non-Event (neither event or excluded)	Holdouts reject Argentina's payment plan.	19Apr13, 5:20pm	Reply	20Apr13, 12:01am	Bloomberg	Holdouts reject Argentina's payment plan. Also conceivably endogenous. The rejection was filed after business hours on Friday, 19Apr13. This is also neither an event nor excluded.
26Aug13	Close-to-Close, 22Aug13 to 23Aug13	Appeals court upholds Griesa's decision.	22Aug13, 4:21pm	Decision	23Aug13, 4:02pm	Bloomberg	The appeals court announces decisions during the business day. The modification date of the PDF is 10:17am. However, because the

Two-Day Window End	Event Type	Description	PDF Time (EST)	Decision Link	News Time (EST)	News Link	Comments
11Sep13	Non-Event	Supreme court schedules hearing to consider Argentina's appeal.	Missing	Docket Info.	11Sep13, 2:35pm.	Bloomberg	The supreme court distributed case materials related to Argentina's petition. We were advised that this is routine and not "news," so we do not count is as a ruling.
26Sep13	Excluded	Holdouts had petitioned Griesa to consider the Argentine central bank liable for the defaulted debt. Argentina motioned to dismiss, and Griesa rejected Argentina's motion.	Missing	Missing	25Sep13, 5:40pm.	Bloomberg	We were not able to find Griesa's ruling, so we exclude this event.
04Oct13	Open-to-Open, 03Oct12 to 04Oct13	Griesa bars Argentina from swapping the exchange bonds into Argentine-law bonds.	03Oct13, 2:43pm.	Order	03Oct13, 6:27pm.	Bloomberg	
08Oct13	Open-to-Close, 07Oct13	Supreme court denies Argentina's first petition.	N/A	Order	07Oct13, 11:45am	SCOTUS Blog	The stock market opens (9:30am EST) before the Supreme court issues decisions (9:30am or 10:00am EST).
19Nov13	Open-to-Open, 18Nov13 to 19Nov13	Appeals court denies Argentina's request for an en-banc hearing.	18Nov13, 11:04am	Denial	19Nov13, 12:01am	Bloomberg	The modification time of the orders is 4:53pm.
13Jan14	Open-to-Close, 10Jan14	Supreme court agrees to hear Argentina case.	10Jan14, 2:42pm	Order	10Jan14, 2:48pm	SCOTUS Blog	The supreme court usually announces orders at 10am. The document was likely posted afterwards.
17Jun14	Open-to-Close, 16Jun14	Supreme court denies Argentina's second petition.	See Text.	Denial	See Text.	SCOTUS Blog	The text discusses this event in detail.
23Jun14	Open-to-Open, 20Jun14 to 23Jun14	Griesa prohibits debt swap of exchange bonds to Argentine law bonds.	20Jun14, 2:17pm	Order			20Jun14 is an Argentine holiday, so the ADRs are missing. This event is excluded from most of our analysis because of the two-day windows (it overlaps with the event below).

Two-Day Window End	Event Type	Description	PDF Time (EST)	Decision Link	News Time (EST)	News Link	Comments
24Jun14	Open-to-Open, 23Jun14 to 24Jun14	Griesa appoints special master to oversee negotiations.	23Jun14, 12:36pm	Order	23Jun14, 7:35pm	Bloomberg	The modification date for the order is 1:05pm, past the London marks.
27Jun14	Open-to-Close, 26Jun14	Griesa rejects Argentina's application for a stay, pending negotiations.	26Jun14, 11:40am	Order	26Jun14, 2:05pm	Bloomberg	
30Jun14	Non-Event	Argentina misses a coupon payment					
29Jul14	Open-to-Open, 28Jul14 to 29Jul14	Griesa allows Citi to pay Repsol bonds for one month.	28Jul14, 3:51pm	Order	28Jul14, 12:01am	Bloomberg	The modification time on the order is 5:07. This event almost certainly occurred post-close, but we use the one day window to be safe.
30Jul14		The 30-day grace period for the missed payment expires.				Bloomberg	We end our dataset on 29Jul14.