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From Bear Stearns to Anglo Irish: How Eurozone Sovereign Spreads Related to Financial Sector Vulnerability

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European Department

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Abstract

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This paper attempts to explain the recent rise and differentiation of sovereign spreads across the countries of the eurozone. Following the onset of the subprime crisis in July 2007, spreads rose but mainly on account of common global factors. The rescue of Bear Stearns in March 2008 marked a turning point. Countries thereafter were increasingly differentiated. Sovereign spreads of a eurozone country tended to rise when the prospects of its domestic financial sector worsened. It appears, therefore, that the rescue of Bear Stearns created a link between financial sector vulnerabilities and a larger contingent liability on public finances. Following the failure of Lehman Brothers, spreads also rose faster for countries with higher ratios of public debt-to-GDP. These transitional dynamics appear to have concluded with the nationalization of Anglo Irish: sovereign spreads throughout the eurozone jumped, with the jump emphasizing the differentiation by financial sector vulnerability and public debt levels. The results imply that, to varying degrees, countries may have moved to a new regime of weak economic outlook, financial sector fragilities, and strains on public finances.

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I. INTRODUCTION

In the third week of July 2007, when the subprime crisis was just placing the world on notice, the yield (interest rate) on the 10-year maturity Irish sovereign bond was *lower* than the yield on a comparable German sovereign bond. Then, as Irish rates started rising, German rates remained low, with a tendency even to fall as investors sought safety. The spread between Irish and German yields rose rapidly: in the last week of January 2009, the Irish sovereign bonds paid about 260 basis points more than the German bond.² This spread—or risk premium—has fluctuated since, but remains near its highest level since the formation of the eurozone. The size of the spread and, particularly, the swing in a matter of 18 months make Ireland stand out, possibly along with Greece. However, spreads have increased substantially throughout the euro area (Figure 1A). The spreads are the market's measure of a country's risk of default. While even at the currently elevated levels, the perceived probability of default remains relatively low, markets have determined that higher risk premia are warranted, and more so for some countries.

These striking developments follow several years of tranquility in eurozone bond markets. After the introduction of the euro in January 1999 and up until the subprime crisis hit global financial markets in mid-July 2007, spreads on bonds of eurozone members had moved in a narrow range with only modest differentiation across countries (Figure 1B).³ The stability and convergence of spreads was considered a hallmark of successful financial integration within the eurozone. The ongoing instability and divergence have raised far reaching questions. Some have even been led to question the viability of the euro as a common currency.

For policymakers, there may be some comfort in the recognition that the wider spreads are due, in the first instance, to external factors. Global financial stress, having infected a widening range of financial asset classes, has also fed through to the bonds of eurozone sovereigns. If the potency of these common external factors is mitigated over time, spreads should come down. But while common factors have played their role, they do not explain the increased dispersion of spreads. In this paper, I conclude that the wider and more diverse spreads also reflect domestic vulnerabilities. The implication is that higher spreads could persist since the financial vulnerabilities uncovered by the global crisis and weaker growth prospects have the potential to reinforce each other. In this sense, the paper is documentation of a transition from a benign equilibrium to a new, more stressed equilibrium.

² 100 basis points equal one percentage point.

³ At the launch of the euro on January 1, 1999, 11 members of the European Union were admitted to the eurozone. These included Austria, Belgium, Finland, France, Germany, Ireland, Italy, Luxembourg, the Netherlands, Portugal, and Spain. Greece was admitted on January 1, 2001. Following the expansion of the European Union in May 2004, Cyprus, Malta, Slovenia, and Slovakia are now also part of the eurozone.

The paper empirically tests the thesis that once the global financial stress crossed a threshold, the vulnerability of a country's financial sector played an increasingly central role in the dynamics of that country's sovereign spreads. The threshold seems to have been crossed about the time that Bear Stearns was rescued in March 2008. The significance of Bear Stearns is possibly manifold. The subprime crisis had been in progress for about nine months, reaching a point where a major financial institution—with strong connections to other major financial institutions—was under severe pressure. Public support to rescue Bear Stearns created a tangible link between the financial sector and public finances. The key finding of this paper is that such a link subsequently played out at the country level, reflecting the specific weaknesses of each country's financial sector.

More recently, after the failure of Lehman Brothers, countries have also been differentiated by their prevailing public debt-to-GDP levels. While Lehman was allowed to fail, the message immediately was that the risk of doing so was great and subsequent public commitment to shore up the financial sector has been clear. But, in addition, following the Lehman episode, there was a substantial reevaluation of global growth prospects. Countries with higher debt levels faced more stress on their debt servicing capabilities and, hence, were penalized more. These transitional dynamics appear to have concluded with the nationalization of Anglo Irish on January 15, 2009: in the following two weeks, sovereign spreads throughout the eurozone jumped, with the jump further emphasizing the differentiation by financial sector vulnerability and public debt levels.

The paper analyses the determinants of weekly *changes* in the sovereign bond spreads of 10 eurozone countries. Estimates based on monthly changes are also presented to assess the timing of the effects and the robustness of the results. The countries included in the analysis are Austria, Belgium, Netherlands, Finland, France, Greece, Ireland, Italy, Portugal, and Spain. Germany is excluded since the yield on the benchmark “German Bund” is treated as the “risk-free” rate or the numeraire over which each country's spreads are computed.⁴ Also excluded are Luxembourg (which has limited traded public debt) and Cyprus, Malta, Slovakia, and Slovenia, countries that have entered the euro area only recently. For a high-frequency measure of financial sector prospects, I use the ratio of the financial sector equity index over the overall equity index. When this index goes down, the market is assessing that the financial sector is more vulnerable than the rest of the economy.⁵

⁴ The spreads are based on yields reported in the secondary market trades of government bonds. Spreads on credit default swaps (CDS) offer another perspective on the market's perception of default risk. Because CDS spreads are, in effect, an insurance premium on a notional outstanding amount, they exist also for Germany—and these have also risen (and, in this sense, the notion the German Bund is “risk free” is not necessarily precise). For the purpose of this paper, CDS spreads are not suitable since the series are shorter and the markets are thinner than for the conventional government bonds.

⁵ It is also possible to use the CDS spreads of banks to measure the market's perception of their vulnerability. As with sovereign CDS spreads, the series are short and the markets thin.

The analysis starts in January 2006 and runs through to January 2009. The results trace the evolving determinants of spreads over the course of these three years and also differentiate across groups of countries. In summary, the conclusions are:

- Before the start of the subprime crisis in July 2007, the weekly changes in spreads were essentially random with no obvious determinants. Once the crisis started and through to the rescue of Bear Stearns, the movement in spreads reflected global factors, in particular a flight to quality and global financial sector instability. After the Bear Stearns rescue, the global factors became less relevant and the prospects of the domestic financial sector acquired a more prominent role in explaining changes in sovereign spreads.
- The sensitivity of countries to their domestic vulnerabilities appears to be conditioned by their loss of competitiveness over the upswing of the previous economic cycle. The countries with the largest decline in competitiveness display a particularly strong link between the prospects of the financial sector and sovereign spreads. A statistically-significant relationship also exists for the other countries, but its economic strength is more moderate. The differentiation of countries by their debt levels is also stronger where the loss of competitiveness has been greater. The inference is that as external competitiveness has weakened, domestic vulnerabilities have acquired greater salience.

The findings reported in this paper are consistent with the historical evidence. Reinhart and Rogoff (2008) document that a country's banking crisis has been followed by a substantial run up in its public debt-to-GDP ratio. Today, with heightened financial sector stress, markets have anticipated the rise in public debt and the spreads on sovereign debt have, therefore, risen. The contribution of this paper is to track how this process has unfolded in the current context.

However, an important point that Reinhart and Rogoff make is that the eventual rise in public debt is only partly due to the direct costs of rescuing distressed financial institutions: the bulk of the rise in the public debt-to-GDP ratio reflects the slowdown in growth associated with the banking crisis. This is also likely to be the case for the ongoing crisis. The growth environment notably weakened through much of 2008, and projections were particularly sharply marked down after the fall of Lehman Brothers in September. I offer a view, with some speculative evidence, that low growth, financial sector vulnerability, and higher spreads tend to go together. A financial accelerator-type mechanism operates, whereby weakness in the financial sector and the real economy reinforce each other. Together, they generate a surge in public debt ratios and higher spreads. In turn, the higher risk premia hurt financial sector and growth prospects.

The rest of the paper is organized as follows. Section II describes the data and the econometric approach. In Section III, I establish the case that the domestic financial sector

matters in explaining changes in sovereign bond spreads; this link holds even when various global influences are accounted for. Section IV, then, traces this link through the different phases since the triggering of the subprime crisis, revealing its emergence post the Bear Stearns rescue. In Section V, I examine the differences between country groups with large and more moderate losses in competitiveness. Section VI offers a more broad brush interpretation of the findings, relating them to the significant downward reassessment of short-term global growth prospects and arguing that low growth, a fragile financial sector, and rising public debt with high spreads can emerge as a new equilibrium absent decisive intervention in the financial sector. A brief conclusion follows.

II. THE DATA AND ECONOMETRIC APPROACH

The sovereign spread for country “i” at time “t”, S_{it} , is measured as the difference between secondary-market yield on the country’s 10-year bond and the yield on the German 10-year benchmark government bond (the German “Bund”). Since the yield on the Bund is regarded as a “risk-free” rate, the spread is the premium paid for the risk of default. Figure 2 plots the sovereign spread for each country against a measure of the prospects of the financial sector. This measure, F_{it} , is the ratio of the equity index of the country’s financial sector divided by the overall equity index. Thus, a fall in F_{it} indicates that the financial sector is expected to underperform the rest of the economy. Figure 2 shows an inverse relationship between S_{it} and F_{it} : this is the case quite consistently for all countries with the exception of Finland where the relationship does not hold for certain stretches. In other words, as markets revised down their view of a country’s domestic financial sector, sovereign spreads rose. Notably, the large rise in Irish sovereign spreads was accompanied by a particularly large decline in the market’s assessment of the country’s financial sector prospects. Normalized to 100 in the first week of January 2006, Irish F_{it} , was down to below 15 in the last week of January 2009.

To explain the risk premia paid, the explanatory variables used in the analysis proxy for deterioration of countries’ debt dynamics and/or worsening of the risk environment. A key presumption is that domestic financial sector stress projects a deterioration of debt dynamics. The following relationship is first specified in *levels* to motivate the discussion:

$$S_{it} = \alpha + \sum_{s=0}^p \beta_{i,t-s} S_{i,t-s} + \sum_{s=0}^m \lambda_{i,t-s} F_{i,t-s} + \sum_{s=0}^n \phi_{i,t-s} Z_{i,t-s} + \varepsilon_{it}$$

Possible persistence in the spreads is captured by their lagged values. Weaker prospects of the financial sector (a lower F_{it}) is hypothesized to raise spreads either because of larger anticipated bailout costs or because a weak financial sector pulls down growth prospects and hence worsens debt dynamics. The notion of flight to quality is captured by level of the German Bund (B_t). If the yield on the Bund falls mainly because investors seek safe assets, spreads will rise, which will be reflected in a negative coefficient on the Bund. Also, global risk perceptions (Z_t) will raise spreads.

There are a number of econometric issues associated with estimating this relationship. First, as is clear from Figure 2, both S_{it} and F_{it} trend. As such, the equation is estimated in first differences: in other words, the estimation explains the *change* in spreads. Second, although weekly observations for the full time period allow for country-by-country estimations, as will be evident quickly below, there is an important evolution over time. Investigating this evolution even with weekly data is not possible on a country-by-country basis since the sample size becomes too small. To maintain comparability of results, it, therefore, helps to stay within a common panel framework throughout. Third, within that panel framework, because the time series dimension of the data is relatively long even for the smaller samples, the endogeneity concern on account of the lagged dependent variable does not arise. Hence, dynamic panel data techniques are not required. Instead, the panel estimation technique used allows for heteroskedasticity, i.e., for the variance of the error terms to vary by country. It allows for first-order autocorrelation in errors and for contemporaneous correlation of error terms across countries and, hence, accounts for unobserved global shocks felt by all countries.⁶

Fourth, the data suggest that common unobserved factors may have shifted the average change in spreads as the crisis moved through different phases. Table 1 shows that with the onset of the subprime crisis, spreads everywhere tended to rise through to the rescue of Bear Stearns in March 2008 by, on average, $\frac{3}{4}$ basis points per week. Following the rescue, in a brief respite, spreads fell in the next two months or so—all countries experienced this decline of about $1\frac{1}{4}$ basis points per week. Then in May spreads resumed their earlier climb, which accelerated after the fall of Lehman in September. To allow for these period-specific tendencies, I include dummy variables for these different phases. The inclusion of these dummy variables implies that the estimation explains a country's deviation in the change in spreads from the period average change for all countries in the sample. Finally, in all but the set of regressions where I examine the effect of public debt ratios (which do not change much over time), country dummies are included to allow for the influence of unobserved country factors.

With those considerations to guide the analysis, the specification to be estimated is:

$$\Delta S_{it} = \sum_{s=0}^p \beta_{i,t-s} \Delta S_{i,t-s} + \sum_{s=0}^m \lambda_{i,t-s} \Delta F_{i,t-s} + \sum_{s=0}^n \phi_{i,t-s} \Delta Z_{i,t-s} + \varepsilon_{it} + \delta_i + \sum D_t$$

⁶ As Beck and Katz, 1995 suggest, we allow for a common autocorrelation coefficient for all countries. They caution that this is best since it guards against the risk of mismeasurement of the autocorrelation coefficient for individual countries. In practice, the results do not change in any significant manner if the autocorrelation coefficients are country specific.

Where, δ_i is a country dummy and

$D_1 = 1$ between week of December 12, 2005 and July 13, 2007 and zero otherwise.

$D_2 = 1$ between week of July 20, 2007 and March 7, 2008 and zero otherwise.

$D_3 = 1$ between week of March 14, 2008 and May 16, 2008 and zero otherwise.

$D_4 = 1$ between week of May 23, 2008 and September 5, 2008 and zero otherwise.

$D_5 = 1$ between week of September 12, 2008 and beyond and zero otherwise.

In sum, the goal of the paper is to use the short-term (weekly and monthly) variations in sovereign spreads and their correlates to help identify the factors that have led to the rise and dispersion in spreads. There remains the thorny question of whether these short-term correlates are “determinants” of spreads in a causal sense—I will discuss below to what extent we can use the timing of effects to draw inferences about causality.

III. DOMESTIC FINANCE MATTERS

A set of exploratory results is reported in Table 2. Their primary goal is to establish a *prima facie* case that changes in prospects of the domestic financial sector foreshadowed the rise in sovereign spreads. The regressions also examine the lags in the relationships—not just for their intrinsic interest but also for what they may tell us about the sequencing of developments and hence (potentially) about causality. The following findings emerge. First, the coefficients on the lags of the dependent variable itself are negative: the rise in spreads tends to overshoot and then is pulled back somewhat over the next few weeks. Second, financial sector prospects have the expected relationship: when financial stocks fell faster than the overall equity index, sovereign spreads tended to go up. The coefficient on the contemporary effect is insignificant. Rather, the lagged effects from the previous three weeks are statistically significant. In other words, following the observed weakness in financial sector prospects, sovereign spreads rose with a delay of a few weeks.

The absence of a contemporary effect and the presence of lagged effects suggest there may have been a causal influence from financial sector weakness to larger spreads. The objection to this inference would be that reverse causality may nevertheless operate if anticipating weakness in public finances, the market perceives a diminished government ability to support banks and hence marks down their equity prices. But such a possibility appears unrealistic: if markets were indeed persuaded that government finances were under greater strain, it is not clear why financial stocks would be marked down before sovereign spreads rose. At the very least, there would be a contemporaneous relationship. Instead, the evidence suggests that

news of financial sector developments filters its way into a reassessment of the government's fiscal commitments and sovereign bond spreads.⁷

Finally, this exploratory exercise corroborates the differences across the phases of the crisis reported in Table 1. In particular, the final phase—after the fall of Lehman Brothers—is associated with a general increase in sovereign bond spreads of about 4 basis points a week. Controlling for these time effects does, as expected, reduce the strength of the economic relationship between financial sector weakening and the rise in sovereign spreads. However, the time pattern of that relationship remains unchanged and the statistical relationship remains clear and strong.

Table 3 examines if other common drivers (those not captured by the period dummies) lie behind the link between domestic financial sector developments and sovereign spreads. Since there is no single metric of global financial impairment, I examine the role of several possible candidates. Consider first the role of the “risk-free” rate in influencing the spread. Two contrasting possibilities have been noted in the literature (for a discussion, see Eichengreen and Mody, 1998). If a higher risk-free yield implied a more adverse global environment, the rise in the risk-free rate would be associated with larger spreads on risky assets. Some have interpreted the higher cost of international funds to emerging markets in the first half of the 1990s as a consequence of rising U.S. Treasury rates. In the current situation, however, global risk is being reflected in a fall in the risk-free rate. The German Bund and corresponding U.S. instruments have served as instruments of safe haven. In such an environment, “flight to quality,” would imply that the risk-free rate and spreads would move in opposite directions. Investors seeking refuge in the risk-free assets would shy away from the risky assets, raising their spreads.

The evidence in Table 3 does point to a flight to quality. Given the nature of the phenomenon, the presumption is the flight to quality is a contemporary occurrence. As such, to the specification in Table 2, I add the contemporary German Bund (using its contemporary weekly change, since the entire estimation is in first differences). The fall in the yield on the German Bund has been associated with a statistically-significant rise in spreads on eurozone sovereign bonds. Note, however, that with inclusion of the Bund as an explanatory variable, the prior results do not change materially.

The next step was to investigate if other global measures of financial distress correlated with rising sovereign spreads. Although there is no one measure of European stock market volatility, the volatility measures across countries are highly correlated. As such, the widely-

⁷ Reversing the regression, with the financial sector equity index (normalized by the overall equity index) as the dependent variable and the lags of the sovereign spreads as explanatory variables (along with the other control variables reported in Table 3), confirms that sovereign spreads do not predict a change in the financial sector prospects.

used measure of U.S. stock market volatility, the VIX, is a reasonable candidate to proxy for global financial instability. However, movements in the VIX do not appear clearly or consistently linked to European sovereign spreads. Instead, the spreads on the credit default swaps (CDS) of U.S. banks appear to have a short-term relationship with European sovereign spreads. Again, CDS spreads across countries have moved considerably in tandem over this period (see Eichengreen et. al, 2009). As such, the U.S. banks' CDS spreads can reasonably be interpreted as a proxy for global financial sector stress. The finding is that a rise in the U.S. banks' CDS spreads in the previous week (and to a lesser extent also in the week prior) are followed by a rise in European sovereign spreads. Once again, the other results do not change.

Finally, although global financial institutions have faced coordinated shocks, there is, nevertheless, an intrinsic interest in the role of the U.K. financial sector in influencing eurozone spreads. Since the CDS spreads of U.K. banks do not add new information, I used the ratio of the financial sector equity index to the overall equity index, as for the individual eurozone countries above. The last two columns of Table 3 show that the prospects of the U.K. financial sector do not proxy for the prospects of financial sectors in the individual eurozone countries and neither do they add new information in explaining eurozone sovereign spreads.

In sum, the analysis thus far leads to the following three conclusions. First, the market's perception of the weakening of a country's financial sector prospects was followed by a rise in that country's sovereign spreads. Second, a generalized post-Lehman influence significantly raised risk premiums. And, third, this effects remains even when an effort is made to more directly identify the role of global factors: the evidence points, in part, to a flight-to-quality and to higher risk premiums related to global financial sector stress (as proxied by the spreads on U.S. credit default swaps).

Despite the control thus far for omitted variables, there remains a real possibility that some unaccounted-for common factor is driving a country's short-term financial sector developments and sovereign spreads. In Section VI, I propose that a downward revision of the country's growth outlook is most plausibly the common factor linking the government's risk premium and the financial sector weakness. These links between growth, financial sector prospects, and sovereign risk are likely to be mutually reinforcing. However, before venturing into this more speculative realm, I report below on the changes over time in the relationships uncovered thus far and the differences across country groups.

IV. THE PHASES OF THE CRISIS

The overall relationship described in the previous section conceals a surprisingly smooth, but intuitively sensible, evolution (Table 4). Up until the start of the subprime crisis, the changes in spreads are not explained by the variables used in this analysis, and R-squared of the regressions is also small (column 1, Table 4). The movement in spreads was essentially

random. This is consistent with earlier studies, as summarized by Codogno et al. (2003) and Pagano and von Thadden (2004). While the cross-sectional differences in spreads across countries do reflect their debt levels or credit rating, the changes in spreads over time since the inception of the European Monetary Union have no ready explanation. Pagano and von Thadden (2004) conclude that explaining the time variation in spreads has been “challenging.”

A. From Subprime Onset to Bear Stearns

Starting with the onset of the subprime crisis in mid-July of 2007 and going through to the rescue of Bear Stearns in mid-March 2008, the variation in sovereign spreads is no longer white noise (column 2, Table 4). The change in spreads is related to “global factors,” both flight to quality (captured by the response to changes in the German Bund yield) and global financial risk (as proxied by the change in the CDS spreads of U.S. banks). Thus, the global factors that were seen as associated with change in spreads in the overall regression are seen to dominate in this first phase of the crisis. Two implications follow. First, global risk aversion, which was spreading to various asset classes, became a perceptible factor in the sovereign bond markets—what is remarkable is that this occurred so early in the evolution of the crisis. Second, at least as first approximation, these factors influenced all countries equally (interacting them with country dummies did not lead to clear results), and, as such, there was a general tendency for spreads to rise with minimal country differentiation (this is confirmed also in Section V, where regressions for different country groups are presented).

B. After Bear Stearns

Starting with the rescue of Bear Stearns, three trends are noticeable. First, the influence of the identifiable global factors steadily declined. Thus, columns 3-5 of Table 4 show that though the sign on the coefficient for the German Bund remained negative, indicating a continued flight to quality, the size of the coefficient fell and turned statistically insignificant. Similarly, the (partial) correlation between the change in CDS spreads of U.S. banks and the change in eurozone sovereign spreads declined. Second, external factors did play a role in the post-Bear Stearns phase: but this was so in a less pinpointed sense and reflected after Lehman in a general upward pressure on spreads, proxied by the dummy for that last period. Finally, the big change in the post-Bear Stearns phase was the important role of domestic factors, represented by the market’s assessment of financial sector prospects. This was the source of spreads’ differentiation.

Thus, Bear Stearns marked an important turning point in the crisis as seen through the lens of eurozone sovereign spreads. The debate on whether or not Bear Stearns should have been bailed out has hinged on the risk of moral hazard—critics have warned that bank managers will become even more irresponsible while proponents of the rescue have been focused on the stability of the financial system. Even as that debate plays out, the data show that there was an immediate impact. The implicit assumption that systemically-important banks would typically be bailed out was converted into an explicit and close tie between banks and the

dynamics of public finance. Interestingly, the Bear Stearns rescue initially generated optimism that the financial sector had become safer and, as Table 1 shows, sovereign spreads fell. However, that optimism lasted briefly. Two months later, by mid-May, 2008, the financial sector was being perceived as increasingly weaker and sovereign spreads were, once again, on the increase. Thus, although these dynamics became more pronounced after Lehman, the process had already commenced some months earlier.

C. After the Anglo Irish Nationalization

The final phase of these developments followed the nationalization of Anglo Irish Bank. Relative to Bear Stearns, the other book-end of this story, Anglo Irish is a small bank and its nationalization likely did not carry the same market significance as the Bear Stearns rescue. Moreover, the Anglo Irish nationalization came at a time when the global “mood music” was particularly gloomy. But it is the case that markets moved rapidly. Viewed by the authorities as systemically-important to the Irish financial system, the beleaguered Anglo Irish was nationalized late on the evening of Thursday, January 15, 2009.⁸ On Friday morning, the share prices of the other major Irish banks—Allied Irish Banks and the Bank of Ireland—fell sharply, by 12.9 and 13.3 percent respectively.⁹ This was the trigger to a new burst of anxiety as financial stocks got hammered and sovereign spreads soared, in Ireland and elsewhere in the eurozone.

In the terminology of this paper, the Irish “F-index,” i.e., the ratio of its financial sector equity index to the overall equity index, had experienced a modest revival after Christmas, rising from 21 in the week starting December 26, 2008 to 24 in the week starting January 9, 2009 (despite the sharp fall in financial sector stocks on the Friday of that week). The F-index then fell back 21 in the week starting January 16 and with that fall, Irish sovereign spreads jumped by sizeable 32 basis points, almost 20 percent over the previous week’s average of 142 basis points. In the week starting January 23, the F-index dived to 14 and the sovereign spreads rose a stunning 80 basis points to 260 basis points, almost 50 percent over the previous week’s average.

The same story played itself out through much of the eurozone. As in Ireland, the F-index had stabilized elsewhere. After Christmas, the average F-index in the other nine eurozone countries in my sample had been stable—though, relative to Ireland, at the much higher level of 77. This index fell by 2 points in the week starting January 16 and spreads jumped by 16 basis points, from 95 to 111 basis points. Then a further fall of the F-index by 3 points was associated with a rise in spreads to 123 basis points.

⁸ Irish commentators have questioned whether Anglo Irish was, in fact, systemically important.

⁹ http://www.forbes.com/2009/01/16/anglo-irish-update-markets-equity-cx_ll_vr_0116markets08.html

Thus, a significant shift occurred in the second half of January 2009 as the financial sector appeared to weaken further and sovereign spreads climbed rapidly. It was, as if some threshold had been crossed, triggering a surge in spreads. However, it is also evident that countries were differentiated even in the midst of these sweeping changes. To explore country differences, the data for the estimations presented in Table 5 is extended to include weeks of January 16 and January 23. Recognizing that the developments during this period were special, I add a post-Anglo Irish dummy for these two weeks. This dummy is interacted in column 1 with the *level* of the F-index. The hypothesis is that spreads moved not just in response to the *changes* in the F-index as had been the case since the Bear Stearns rescue. Rather there was an accelerated transition to higher spreads responding to the level of the F-index, as if markets were recalibrating to the cumulative deterioration of financial sector prospects.

The results in Table 5 confirm this presumption. As column 1 shows, spreads tended to rise everywhere (the post-Anglo Irish dummy is positive and significant) but the rise in spreads was greater for countries with a lower F-index (the interaction term is negative and significant). That this was not driven by the extreme Irish developments is confirmed in column 2 where the finding holds even if Ireland is not included in the regression.

Column 3 explores the possibility that countries were also differentiated by their debt levels.¹⁰ And there seems some reason to think that that was the case. The interaction term is positive, implying that in those two weeks, countries with higher public debt experienced, all else equal, more rapid increase in spreads. This is more evident when Finland, which has a very high F-index, is also dropped from the sample. It is the case that the interaction of the post-Anglo Irish dummy and the debt-to-GDP ratios is not significant at the customary 5 percent level. However, all that says is that countries with relatively low levels of debt were not necessarily differentiated; with higher debt levels, both the size of the post-Anglo Irish effect *and* its statistical significance are larger.

Thus, in the last two weeks of January, an ongoing process was accelerated. While in the period leading up to mid-January, changes in financial vulnerability were followed by a rise in spreads, in the final weeks of January, spreads responded to the level of vulnerability. Markets evidently decided that they had some catching up to do. And that catch up had a tangible goal in some countries. For the most part, spreads on banks' own debt had been higher than on sovereign spreads from the start of the subprime crisis. This was true for much of the period and for most countries. Only in Italy and Portugal, bank and sovereign spreads had converged, with sovereign spreads actually rising above bank spreads sometime after the

¹⁰ Public debt ratios, which do not change from one week to another (since they are reported only once a year), are part of the country fixed effects. Hence, only the interaction is included. A more extensive treatment of country differentiation by debt ratios is reported in the next section. Throughout, I proxy a country's debt by its gross public debt-to-GDP ratio. While net debt is always lower, the rank ordering across countries remains unchanged.

fall of Lehman Brothers. The last two weeks of January saw a wider convergence of spreads: even as sovereign spreads rose, bank spreads fell as if the sovereign had taken on the risk of the financial sector. After those two dramatic weeks, bank spreads have once again typically been higher than sovereign spreads. However, the significance of the last two weeks of January appears to be that sovereign and bank risks caught up with each other and have tended thereafter to exhibit more comovement rather than the lagged relationship observed in the previous months.

D. Monthly Variations in Spreads

To provide further perspective on the timing of developments—but also as a test of the robustness of the findings—Table 6 reports on the *monthly* rather than weekly changes in spreads. The post-Anglo Irish phase is excluded since it can be captured only with weekly data. Hence, the analysis once again ends in the second week of January, implying that the “January” observation is the average of the first two weeks.

The results are reassuring. The one finding that is statistically weaker relates to U.S. banks’ CDS spreads. Though remaining positive in sign, the coefficient is no longer significant. It is as if the impact from the CDS spreads reversed relatively quickly, and is, therefore, not evident over the longer horizon. As we see below, there is some country variation in this finding, but, in general, the monthly data give less emphasis to the role of CDS spreads. For the rest, the results are remarkably similar. Flight to quality is evident before Bear Stearns and then weakens afterwards. And, as before, the global effects reappear after the Lehman failure as a generalized aversion to eurozone sovereign bonds in the period dummy variable. Importantly, the domestic financial sector vulnerabilities play little role before Bear Stearns but are significant correlates of sovereign bond spreads thereafter as the factor differentiating the evolution of countries’ bond spreads.

V. COUNTRY DIFFERENCES

Are the countries across the eurozone affected uniformly by the factors identified above? Or, are there interesting and helpful distinctions across groups of countries? In asking these questions, the results are also subjected to a sensitivity test to assess if the key findings are being driven by one country or a group of countries.

In conducting this analysis, Leamer’s (2009) injunction is useful. He urges economists to seek patterns and tell stories. There are many ways to group countries and each is likely to be plausible. In the following, it turns out that grouping countries by their loss of competitiveness reveals interesting patterns and tells an interesting story. Figure 3 is the starting point: it shows the appreciation of real effective exchange rate from January 2003, near the bottom of the previous cycle to July 2008, near the peak. The appreciation of the exchange rate over the previous cycle has an important bearing on how the economy will

behave during the next cycle and hence on the short-term and medium-term growth outlook.¹¹ Figure 3 shows that Ireland had the largest appreciation, followed by Spain and Greece. At the other end, the Netherlands, Austria, and Finland experienced the most modest appreciations. Because these measures are crude, I allow for overlap. Ireland, Spain, Greece, and Belgium are in the “Large Appreciation” group. Belgium, which is on the borderline and by other measures may show a smaller loss of competitiveness, is also included in the “Moderate Appreciation” group along with Italy, France, and the Netherlands. In the same spirit, France, the Netherlands, Finland, and Austria are in the “Low Appreciation” category.¹² Portugal is not included in this analysis. While the inverse relationship between financial sector prospects and sovereign spreads appears in the raw data, the regressions themselves suggest that the time lags in Portugal are different from those in the other countries.¹³

A. Following Bear Stearns: Spotlight on Countries’ Loss of Competitiveness

Notice, first, that following the onset of the subprime crisis but before the Bear Stearns rescue, the patterns are quite similar across countries (Table 7). As for the full sample of countries, global factors are influential for each of the groups and the domestic financial sector plays a limited role. Moreover, the coefficients on the global factors are close in size. This supports the claim made above that the eurozone sovereign bond markets had come within the ambit of the international financial tensions early on in the crisis, but there was no evident tendency towards a differentiation of spreads before Bear Stearns.

Once Bear Stearns was rescued, markets placed a special spotlight on domestic vulnerabilities, and particularly so in the countries that had suffered a more sustained loss of competitiveness (Table 8). In countries with the largest loss in competitiveness, a weaker financial sector translated into the greatest increase in sovereign spreads. This result does not appear to depend on any one country: dropping a particular country from this smaller sample

¹¹ Instead of this admittedly crude measure, an alternative would be to assess the deviation from “equilibrium exchange rates.” However, there are also well-known difficulties in such an assessment. Also, the change in the real exchange rate likely has different sources for different countries. For some, the movement of the euro against the dollar and the pound sterling are more relevant than intra-euro area inflation differentials. Again, I do not pursue these distinctions.

¹² With this overlapping categorization, the country groups have a surprising correspondence with a measure of “overheating.” Ahrend, Cournède, and Price, 2008, estimate the difference between the interest rate that would have been implied by the “Taylor’s” rule and the actual interest rate. They find that the larger this gap, the more rapid the credit growth, appreciation of property prices, and growth of the construction sector. If countries were to be grouped by the size of their gap, all countries (with the exception of Belgium) would be in the same group as by the appreciation of the real exchange rate. In other words, the real exchange rate appreciation and overheating appear to have gone hand-in-hand. The extent of overheating was low in Belgium.

¹³ This could be because Portuguese sovereign and bank spreads converged earlier and the inverse relationship, thereafter became more contemporary.

preserves the finding. The relationship between financial vulnerability and sovereign spreads moderates smoothly as we move across country groups that experienced lower real exchange rate appreciation. To be clear, the relationship remains statistically significant for all country groups. However, both the “short-term” impact—reflected in the sum of the coefficients on the F-index—and the “long-term” impact (that accounts for the overshooting reflected in the lagged terms of the sovereign spreads) decline in potency as the competitive position improves. Columns (3) and (4) differentiate within the final group by first excluding and then including Finland. Column (4) shows that the relationship weakens with the inclusion of Finland. By the metric of this paper, financial sector stress has increased only episodically in Finland. This may simply imply that the metric is not well suited to Finland, given the central role of Nokia in guiding the Finnish stock market. But the fact that the relationship between financial sector stress and sovereign spreads is weaker in Finland than elsewhere is in line with the theme of this section: Finland entered this crisis in a better competitive fit and with the possibly the least signs of overheating among all the countries in the eurozone.

In the post-Bear Stearns phase, the global factors identified above do continue to act but, as with the full sample of countries, they do so in a more moderate way. Flight to quality is less evident in the post-Bear Stearns phase in all three groups. The coefficients on the U.S. CDS are also smaller but they have a statistically-significant influence in the countries characterized as having experienced a moderate loss of competitiveness. The post-Lehman generalized increase in spreads is apparent everywhere.

B. The Role of Public Debt

Finally, I examine another source of domestic vulnerability: public debt. The results in this section reaffirm the theme that domestic vulnerabilities are highlighted where loss of external competitiveness is significant. Note that in this exercise, the intent is not to differentiate countries by debt levels as I have done above for competitiveness. Rather, continuing to think of loss of competitiveness as a proxy for weaker growth prospects, the question being posed is whether countries *within* particular competitiveness loss categories are differentiated by their debt ratios. The presumption is that with lower growth potential, a higher debt ratio will prove more onerous. This differentiation should, moreover, increase when the global growth prospects are substantially marked down, as after the fall of Lehman Brothers.

There are statistical challenges in identifying the relationship between public debt and the high-frequency changes in spreads (as Pagano and von Thadden, 2004, have discussed). The change in public debt ratios has been relatively modest over this short period under consideration. Also, public debt is measured once a year, whereas the change in spreads is being measured at weekly and monthly frequencies. As such, past studies have found no relationship between public debt ratios and the change in spreads. Given, however, the dramatic movements in spreads, it seems reasonable to examine if the rise was more rapid in countries with higher public debt—and, if so, when this effect was most pronounced. Figure 4 lends some plausibility to this enterprise. Even though changes in spreads cannot be traced

to changes in debt levels, debt levels do differentiate the level of spreads across countries. Figure 4 shows that this differentiation accelerated as this crisis unfolded: markets reevaluated the risk premium on the debt even while the debt ratios remained broadly unchanged.

Tables 9 and 10, based respectively on weekly and monthly data, focus on the period following the rescue of Bear Stearns. The question posed to the data is whether a country's *level* of public debt-to-GDP ratio was correlated with a more rapid *increase* in spreads. Empirically, this means augmenting the specification used thus far with terms that interact the time phase dummies with the public debt-to-GDP ratios. As such, country dummies are not included in these regressions.

The results show a rising influence of the debt ratios on the changes in spreads in countries with large and moderate loss of competitiveness. The coefficients on the interaction terms between the public debt-to-GDP ratio and the time period dummies rise over time in both these country groups and acquire strong statistical significance in the post-Lehman period. Thus, countries with large and moderate loss in competitiveness, already facing a challenging growth outlook were faced with more starkly worsening debt dynamics once projected growth rates around the world were marked down in the post-Lehman period. This is clearly less so the case for countries with low loss in competitiveness. Even when Finland is excluded from the estimation, the effect is moderate and the coefficient on the interaction term between the post-Lehman dummy and the public debt-to-GDP ratio does not rise to standard levels of statistical significance.

In conclusion, the stylization of the countries of the eurozone into these groups does not do justice to the further more graded and nuanced variations. Nevertheless, the results do reveal an important pattern: where external competitiveness has been lost, and, hence, growth potential has been compromised, domestic vulnerabilities take on a more worrying role. Thus, although the crisis has been global in nature, domestic vulnerabilities matter. Within the large and moderate competitiveness loss groups, countries have been differentiated both by the developments in their domestic financial sectors and by their public debt ratios. These regressions help, for example, to differentiate Ireland and Greece, two countries with large increases in sovereign spreads. In Ireland, the proximate correlate of the increase in spreads has been the weakening of the financial sector. In Greece, where the markets have been less pessimistic about the financial sector, spreads in the post-Lehman phase have been driven to a greater extent by a reevaluation of the prospects for servicing high levels of public debt. Similarly, the Italian rise in spreads is better accounted for when the differentiation by debt ratios is incorporated into the analysis. In countries with the least loss of competitiveness, financial vulnerability has had a statistically-significant effect but the economic effects are smaller; and the markets have not focused on their public debt dynamics.

VI. INTERPRETING THE FINDINGS

In their important paper, Reinhart and Rogoff (2008) make two noteworthy observations. First, banking crises are followed by a large increase in public debt ratios. Second, that increase is not primarily a consequence of bailout costs. Although bailouts do make a sizeable claim on public resources, the increase in public debt ratios is much larger than the direct costs of the banking sector rescue. As such, they conclude, that the public debt rises relative to the country's GDP mainly because of the sharp slowdown in GDP growth.

The dynamics of eurozone spreads are consistent, I believe, with the cross-sectional evidence presented by the Reinhart and Rogoff. The empirical finding of this paper is that since the rescue of Bear Stearns, the market's perception of increased financial sector fragility has been followed by a perception of greater strain on public finances and, hence, by rising sovereign spreads. But while Bear Stearns created a link between financial sector fragility and public finances, the Reinhart-Rogoff results imply that more was going on. In particular, the overall growth environment within which these dynamics played out had a bearing on the outcomes.

In this respect, three observations are relevant. Consider first the reassessment of growth prospects during 2008. Figure 5 shows the evolution of the consensus forecasts for eurozone growth in 2009. From early 2008 to the failure of Lehman in September, growth projections were marked down steadily. Following the Lehman episode, the downward revisions were precipitous. As such, prospective debt dynamics was already deteriorating at the time of the Bear Stearns rescue took a decisive turn for the worse after the Lehman failure. In that context, the possibility that the fiscal costs of financial sector bailouts could be offset in the short run were limited, strengthening the link between financial sector fragility and rising sovereign spreads.

Second, financial fragility and growth prospects are also linked, through a financial-accelerator-type mechanism. This is a more difficult relationship to pin down and its careful identification would need more work. However, the F-index is correlated with such measures as high-yield spreads, which do well in forecasting growth (Mody and Taylor, 2003). Also, Figure 6 shows that during 2008, the change in the F-index was tracking the consensus growth projections for 2009. The F-index declined the most in Ireland and so did the revision to its growth forecasts. The opposite was true for Finland. The other countries are distributed (albeit noisily) in between Ireland and Finland on both measures. The F-index is thus not just a projection of bailout costs but appears also to be a forward-looking indicator of growth. As the financial sector weakens, so does its ability to support growth. But reduced growth increases the risk of default, exerting greater pressure on the financial system.

Finally, sovereign spreads are potentially also a forward-looking measure of growth, since variations in growth are such critical drivers of debt dynamics. There is some evidence that this is the case. Panel A of Figure 7 shows the sovereign spreads at the end of 2004 and

growth projections for 2005 in early 2005. Panel B does the same for 2008 looking into 2009. While Greece stands out as an exception, the higher the sovereign spread, the lower is the growth projection.

Pulling these factors all together, leads to the possibility that sovereign spreads, the health of the financial sector, and growth prospects support a mutually reinforcing equilibrium. This idea is described in Figure 8. In the northeast quadrant is the relationship identified in this paper between financial sector health and sovereign spreads: a weaker financial sector is associated with wider sovereign spreads. In the southwest quadrant, a weaker financial sector is seen as associated with lower growth. And, in the northwest quadrant, I show the inverse relationship in Figure 7 between sovereign spreads and growth. From a “good” equilibrium, a shock, say, to financial sector health, is associated with larger sovereign spreads and weaker growth prospects. In turn, the weaker growth prospects reinforce the higher sovereign spreads and the fragility of the financial sector, perpetuating the original shock. Repeated shocks can thus move the economy to a new, more stressed regime from which there is no quick return. This logic is consistent with the Reinhart-Rogoff findings; it is also consistent with the observation in the IMF’s October 2008 *World Economic Outlook* that economic recoveries take longer when the crisis also involves distress in the financial sector.

VII. CONCLUSIONS

After the introduction of the euro, the risk premia on the bonds of eurozone sovereigns were compressed in a narrow range, and their short-term movements were essentially random. It was as if markets judged the probability of default by all sovereigns to be negligible. That changed with the start of the subprime crisis in July 2007. Using high-frequency (weekly and monthly) data, this paper exploits the short-term variations in spreads, measures of global financial stress, and a metric of domestic financial fragility to trace the rise and the dispersion of spreads through to January 2009.

The following findings emerge. First, following the onset of the crisis, sovereign spreads in the eurozone rose with the greater sense of global financial instability. In a flight-to-quality, investors sought “risk-free” assets, resulting in lower yields on the German Bund and, hence, higher risk premia elsewhere. At the same time, the global risk metric most closely associated with a rise in sovereign yields was the spread on credit default swaps of U.S. banks.

In a second phase, following the rescue of Bear Stearns in mid-March 2008, a closer tie was established between possible bank bailouts and public finances. This resulted in a new relationship between the prospects of the domestic financial sector and the spreads of the sovereign. In the first instance, it was this new relationship that led to a differentiation in spreads across countries. After the failure of Lehman in September 2008, as the aversion to risk increased, a further source of differentiation emerged, as countries suffering long-term erosion of competitiveness paid an increased penalty for high public debt-to-GDP ratios.

The across-country differentiation by growth prospects is consistent with a more general interpretation of the dynamics of this period. The rescue of Bear Stearns occurred during a period of worsening growth prospects; hence, the expected costs of bank bailout costs increased just when the weaker growth outlook was already threatening to push up debt ratios. The process intensified as markets further downgraded the prospects of the financial sector, which, in turn, reinforced the likelihood of weaker growth and higher debt. This reinforcement of financial fragility, low growth, and higher debt and sovereign risk premia implies that the world moved from the tranquil, pre-crisis equilibrium to a new equilibrium that is likely to persist.

The rise in sovereign bond spreads has generated strong policy pronouncements. Some have viewed these developments as creating a strain on the integrity of the eurozone. But Buiter (2009) insists that such prognostications exhibit sloppy thinking. High default risk differentials between eurozone sovereigns are neither necessary nor sufficient, he argues, to raise the likelihood of the eurozone breaking up. Instead, the opposite may be the case: "... the threat or reality of sovereign default by a eurozone member state is much more likely to reduce that country's incentive to leave the eurozone than to increase it." A eurozone "quitter" would be subject to substantial currency risk in thin markets and would, therefore, face a further substantial rise in its borrowing costs. Moreover, any temporary gain in international competitiveness made possible by a depreciated nominal exchange rate would be quickly eroded absent measures to deal with "real" rigidities and increase long-term productivity.

My analysis supports that of Buiter but points to the key domestic policy challenge as lying in the fragility of the financial sector. This immediate challenge needs to be dealt with, quite independently of regaining competitiveness, which is a longer-term process. As long as the financial sector acts as a drag, it will reinforce the shift to higher sovereign spreads and a weak growth outlook. Direct efforts to boost growth can help, but, as Buiter notes, they must be sustainable. Even where such efforts are relatively successful, growth will be weighed down by financial sector vulnerability, which will continue to keep risk premia high.

Finally, what does this episode tell us about whether markets discipline governments? Markets did not create "discipline" in the sense that they went along with the euphoria that produced the equilibrium of low spreads, apparently healthy financial sectors, and strong growth (including where some of that growth was the consequence of overheating in countries that were deferring the task of dealing with their loss of competitiveness). However, once these fragilities became more evident and gathered force, markets have reacted to reveal the underlying fragilities. As such, markets are now exerting pressure on governments to improve the state of public finances and restore competitiveness. How long these pressures will last and whether they will elicit the necessary policy responses are remain matters of more than academic interest.

Table 1. Weekly Changes in Spreads (basis points)

	Pre-Subprime	From Subprime To Bear Stearns	Post Bear Stearns: Phase 1	Post Bear Stearns: Phase 2	Post Lehman	Average for the entire time period
Austria	0.10	0.42	-0.39	0.29	3.78	0.56
Belgium	0.08	1.06	-1.74	0.76	2.35	0.49
Finland	0.11	0.51	-0.48	0.25	1.82	0.36
France	0.08	0.32	-0.57	0.69	1.21	0.28
Greece	0.06	1.19	-2.30	1.94	8.72	1.28
Ireland	0.06	0.98	-1.09	0.66	5.25	0.81
Italy	0.01	0.95	-1.93	2.10	4.10	0.73
Netherlands	0.08	0.47	-0.65	0.62	1.85	0.36
Portugal	0.06	1.00	-2.05	1.61	2.66	0.57
Spain	0.08	0.54	-0.90	1.57	2.46	0.52
Average for all countries	0.07	0.74	-1.21	1.05	3.41	0.60

Table 2. Does Domestic Finance Matter?

VARIABLES	(1) Δ.S	(2) Δ.S	(3) Δ.S	(4) Δ.S	(5) Δ.S	(6) Δ.S
LΔ.S	-0.02 (-0.32)	-0.08 (-1.35)	-0.08 (-1.30)	-0.13** (-2.22)	-0.16*** (-2.87)	-0.14** (-2.52)
L2Δ.S	-0.11* (-1.84)	-0.13** (-2.25)	-0.13** (-2.20)	-0.22*** (-3.80)	-0.22*** (-3.98)	-0.21*** (-3.78)
L3Δ.S						0.08 (1.34)
Δ.F		-0.06 (-0.82)				
LΔ.F		-0.24*** (-3.23)	-0.24*** (-3.22)		-0.14** (-2.13)	-0.14** (-2.07)
L2Δ.F		-0.37*** (-4.91)	-0.37*** (-4.92)		-0.29*** (-4.18)	-0.29*** (-4.31)
L3Δ.F		-0.23*** (-3.20)	-0.23*** (-3.17)		-0.17** (-2.48)	-0.16** (-2.42)
Subprime to Bear Stearns				0.76 (1.31)	0.57 (0.99)	0.54 (0.94)
Post Bear Stearns: Phase 1				-1.07 (-1.13)	-0.81 (-0.86)	-0.88 (-0.94)
Post Bear Stearns: Phase 2				1.14 (1.48)	0.98 (1.27)	0.92 (1.21)
Post Lehman				4.46*** (5.78)	4.17*** (5.44)	3.79*** (4.86)
Constant	0.64*** (2.77)	0.58** (2.53)	0.59** (2.57)	0.02 (0.05)	0.05 (0.15)	0.05 (0.18)
Observations	1560	1550	1550	1560	1550	1550
R-squared	0.02	0.07	0.07	0.14	0.16	0.16
p-value for sum of F=0		0.00	0.00		0.00	0.00

z-statistics in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Table 3. Domestic Finance Does Matter

VARIABLES	(1) Δ.S	(2) Δ.S	(3) Δ.S	(4) Δ.S	(5) Δ.S
LΔ.S	-0.16*** (-3.03)	-0.13** (-2.35)	-0.16*** (-2.95)	-0.13** (-2.36)	-0.16*** (-2.97)
L2Δ.S	-0.25*** (-4.55)	-0.24*** (-4.25)	-0.26*** (-4.80)	-0.26*** (-4.72)	-0.26*** (-4.77)
LΔ.F	-0.13** (-2.06)		-0.14** (-2.22)		-0.14** (-2.40)
L2Δ.F	-0.25*** (-3.84)		-0.27*** (-4.12)		-0.28*** (-4.81)
L3Δ.F	-0.19*** (-2.89)		-0.18*** (-2.76)		-0.18*** (-2.80)
Δ.Bund-10y	-5.46** (-2.41)	-5.36** (-2.32)	-5.92*** (-2.64)	-5.70** (-2.44)	-5.94*** (-2.64)
Δ.CDS_US_Banks	0.00 (0.16)	0.00 (0.44)			
LΔ.CDS_US_Banks	0.02** (2.09)	0.02** (2.27)	0.02** (2.40)	0.02*** (2.65)	0.02** (2.41)
L2Δ.CDS_US_Banks	0.00 (0.55)	0.00 (0.36)	0.01 (1.54)	0.01 (1.59)	0.01 (1.53)
L3Δ.CDS_US_Banks	-0.01 (-1.41)	-0.01 (-1.64)			
Subprime to Bear Stearns	0.31 (0.54)	0.49 (0.85)	0.23 (0.41)	0.27 (0.46)	0.22 (0.40)
Post Bear Stearns: Phase 1	-0.62 (-0.67)	-0.84 (-0.89)	-0.52 (-0.57)	-0.79 (-0.87)	-0.52 (-0.57)
Post Bear Stearns: Phase 2	0.65 (0.82)	0.80 (0.99)	0.46 (0.61)	0.54 (0.70)	0.45 (0.60)
Post Lehman	4.09*** (5.15)	4.37*** (5.45)	4.18*** (5.44)	4.17*** (5.16)	4.18*** (5.34)
Δ.F_UK				-0.22 (-1.24)	
LΔ.F_UK				-0.09 (-0.51)	-0.04 (-0.23)
L2Δ.F_UK				-0.14 (-0.83)	0.02 (0.15)
L3Δ.F_UK				-0.08 (-0.50)	
Constant	0.13 (0.43)	0.10 (0.32)	0.14 (0.45)	0.06 (0.20)	0.14 (0.45)
Observations	1550	1550	1550	1550	1550
R-squared	0.20	0.18	0.20	0.18	0.20
p-value for sum of F=0	0.00		0.00		0.00

z-statistics in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Table 4. Phases of the Crisis

VARIABLES	(1) Pre- Subprime $\Delta.S$	(2) From Subprime To Bear Stearns $\Delta.S$	(3) Post Bear Stearns $\Delta.S$	(4) Post Bear Stearns: Phase 2 $\Delta.S$	(5) Post Lehman $\Delta.S$
L $\Delta.S$	-0.07 (-1.21)	-0.08 (-0.47)	-0.23** (-2.43)	-0.28** (-2.45)	-0.30** (-1.96)
L2 $\Delta.S$	0.04 (0.78)	0.08 (0.48)	-0.31*** (-3.36)	-0.37*** (-3.27)	-0.42*** (-2.77)
L $\Delta.F$	-0.01 (-0.35)	0.21 (1.63)	-0.25* (-1.82)	-0.25 (-1.61)	-0.23 (-1.04)
L2 $\Delta.F$	0.01 (0.16)	0.08 (0.66)	-0.47*** (-3.23)	-0.51*** (-3.12)	-0.59** (-2.49)
L3 $\Delta.F$	0.01 (0.17)	-0.14 (-1.08)	-0.26* (-1.90)	-0.32** (-2.07)	-0.28 (-1.30)
Δ .Bund-10y	-1.46 (-1.57)	-14.79*** (-3.13)	-5.34 (-1.19)	-4.65 (-0.85)	-3.57 (-0.43)
L Δ .CDS_US_Banks	0.03 (0.59)	0.08*** (2.91)	0.01 (1.40)	0.01 (0.99)	0.01 (0.79)
L2 Δ .CDS_US_Banks	0.07* (1.68)	-0.01 (-0.25)	0.01 (1.01)	0.01 (0.62)	0.01 (0.48)
Post Bear Stearns: Phase 2			0.72 (0.40)		
Post Lehman			4.63*** (2.62)	4.08** (2.31)	
Constant	0.13** (2.10)	-0.27 (-0.71)	-0.22 (-0.16)	0.31 (0.24)	5.09*** (2.87)
Observations	770	340	440	340	180
R-squared	0.03	0.30	0.26	0.26	0.30
p-value for sum of F=0	0.99	0.50	0.00	0.00	0.03

z-statistics in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Table 5. Explaining the Jump in Spreads After the Anglo Irish Nationalization

VARIABLES	(1)	(2)	(3)	(4)
	$\Delta.S$	$\Delta.S$ Excluding Ireland	$\Delta.S$ Excluding Ireland	$\Delta.S$ Excluding Ireland and Finland
L $\Delta.S$	-0.15 (-1.64)	-0.23** (-2.57)	-0.22** (-2.52)	-0.23** (-2.52)
L2 $\Delta.S$	-0.27*** (-2.97)	-0.33*** (-3.58)	-0.33*** (-3.56)	-0.33*** (-3.50)
L $\Delta.F$	-0.28* (-1.82)	-0.33** (-2.02)	-0.34** (-2.04)	-0.37* (-1.84)
L2 $\Delta.F$	-0.42*** (-2.62)	-0.50*** (-2.94)	-0.50*** (-2.95)	-0.56*** (-2.80)
L3 $\Delta.F$	-0.17 (-1.09)	-0.13 (-0.82)	-0.13 (-0.81)	-0.12 (-0.59)
Δ .Bund-10y	-4.86 (-1.12)	-5.13 (-1.20)	-5.12 (-1.20)	-5.21 (-1.15)
L Δ .CDS_US_Banks	0.01 (1.34)	0.02 (1.59)	0.02 (1.57)	0.02 (1.44)
L2 Δ .CDS_US_Banks	0.01 (0.93)	0.01 (1.18)	0.01 (1.16)	0.01 (1.03)
Post Bear Stearns: Phase 2	0.86 (0.50)	0.75 (0.42)	0.76 (0.43)	1.00 (0.54)
Post Lehman	4.48*** (2.60)	4.55*** (2.60)	4.53*** (2.60)	4.70** (2.54)
Dummy for Post-Anglo Irish	51.01*** (10.36)	27.72*** (6.58)	18.81*** (3.32)	21.95*** (2.63)
F*Post-Anglo Irish	-0.51*** (-10.09)	-0.22*** (-6.85)	-0.19*** (-5.02)	-0.25** (-2.08)
Debt-GDP ratio*Post-Anglo Irish			0.10 (1.49)	0.12* (1.85)
Constant	-0.83 (-0.61)	-0.63 (-0.44)	-0.61 (-0.44)	-0.75 (-0.52)
Observations	460	414	414	368
R-squared	0.40	0.33	0.34	0.34
p-value for sum of F=0	0.01	0.00	0.00	0.01

z-statistics in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Table 6. Phases as Seen Through Monthly Changes in Spreads

VARIABLES	(1)	(2)	(3)	(4)
	Pre-Subprime $\Delta.S$	From Subprime To Bear Stearns $\Delta.S$	Post Bear Stearns $\Delta.S$	Post Bear Stearns: Phase 2 $\Delta.S$
L $\Delta.S$	0.02 (0.13)	-0.23 (-1.45)	-0.18 (-1.05)	-0.18 (-0.95)
$\Delta.F$	0.01 (0.09)	-0.12 (-0.95)	-0.68*** (-3.01)	-0.61*** (-2.84)
L $\Delta.F$	0.13** (2.12)	-0.17 (-1.38)	-0.74*** (-3.41)	-0.76*** (-3.72)
$\Delta.Bund-10y$	0.03 (0.02)	-16.70*** (-5.23)	-12.57* (-1.68)	-4.25 (-0.63)
$\Delta.CDS_US_Banks$	0.17*** (3.83)	0.00 (0.03)	0.01 (0.49)	-0.01 (-0.69)
L $\Delta.CDS_US_Banks$	-0.02 (-0.28)	0.03 (1.47)	0.03 (1.57)	0.01 (0.83)
Post Bear Stearns: Phase 2			-5.07 (-1.20)	
Post Lehman			5.02 (1.16)	9.60** (2.53)
Constant	0.23 (0.90)	-1.71* (-1.82)	3.94 (1.37)	0.08 (0.03)
Observations	180	70	110	80
R-squared	0.19	0.61	0.53	0.62
p-value for sum of F=0	0.05	0.11	0.00	0.00

z-statistics in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 7. Subprime to Bear Stearns: Limited Differentiation Across Countries

VARIABLES	(1)	(2)	(3)
	Ireland, Greece, Spain, and Belgium $\Delta.S$	Belgium, Italy, France, and the Netherlands $\Delta.S$	France, the Netherlands, Austria, and Finland $\Delta.S$
L $\Delta.S$	0.01 (0.04)	-0.04 (-0.18)	-0.23 (-1.08)
L2 $\Delta.S$	0.17 (0.96)	0.14 (0.58)	-0.08 (-0.39)
L $\Delta.F$	0.44* (1.79)	0.17 (0.56)	-0.02 (-0.18)
L2 $\Delta.F$	0.34 (1.36)	0.38 (1.25)	0.09 (0.68)
L3 $\Delta.F$	-0.54** (-2.23)	-0.01 (-0.02)	-0.06 (-0.45)
Δ .Bund-10y	-16.03*** (-3.04)	-14.98*** (-2.86)	-11.24*** (-3.05)
L Δ .CDS_US_Banks	0.08*** (2.73)	0.09*** (2.93)	0.06*** (2.71)
L2 Δ .CDS_US_Banks	0.00 (0.14)	-0.01 (-0.27)	-0.00 (-0.22)
Constant	-0.31 (-0.82)	0.15 (0.27)	-0.12 (-0.36)
Observations	136	136	136
R-squared	0.31	0.32	0.34
p-value for sum of F=0	0.57	0.29	0.98

z-statistics in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Table 8. Post Bear Stearns: Country Differentiation By Loss of Competitiveness

VARIABLES	(1) Ireland, Greece, Spain, and Belgium $\Delta.S$	(2) Belgium, Italy, France, and the Netherlands $\Delta.S$	(3) France, the Netherlands, and Austria $\Delta.S$	(4) France, the Netherlands, Austria, and Finland $\Delta.S$
L $\Delta.S$	-0.11 (-1.14)	-0.40*** (-4.10)	-0.26*** (-2.82)	-0.23** (-2.46)
L2 $\Delta.S$	-0.28*** (-2.86)	-0.38*** (-3.85)	-0.38*** (-4.00)	-0.35*** (-3.64)
L $\Delta.F$	-0.52** (-2.45)	-0.03 (-0.14)	0.08 (0.53)	-0.01 (-0.04)
L2 $\Delta.F$	-0.47** (-2.28)	-0.77*** (-4.03)	-0.58*** (-3.94)	-0.42*** (-3.53)
L3 $\Delta.F$	-0.39* (-1.90)	-0.21 (-1.09)	-0.13 (-0.89)	-0.13 (-1.18)
Δ .Bund-10y	-7.13 (-1.33)	-7.14* (-1.78)	-1.95 (-0.63)	-2.07 (-0.66)
L Δ .CDS_US_Banks	0.01 (1.16)	0.02** (2.04)	0.01 (1.44)	0.01 (1.57)
L2 Δ .CDS_US_Banks	0.01 (0.93)	0.01 (1.60)	0.00 (0.24)	0.01 (0.84)
Post Bear Stearns:	1.01	0.16	-0.12	-0.27
Phase 2	(0.50)	(0.10)	(-0.10)	(-0.22)
Post Lehman	5.14** (2.47)	3.10* (1.87)	2.74** (2.29)	2.76** (2.34)
Constant	-1.03 (-0.65)	1.99 (1.12)	1.20 (1.17)	1.17 (1.13)
Observations	176	176	132	176
R-squared	0.29	0.35	0.36	0.30
p-value for sum of F=0	0.00	0.01	0.02	0.02

z-statistics in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Table 9. The Role of Public Debt

VARIABLES	(1) Ireland, Greece, Spain, and Belgium $\Delta.S$	(2) Belgium, Italy, France, and the Netherlands $\Delta.S$	(3) France, the Netherlands, and Austria $\Delta.S$	(4) France, the Netherlands, Austria, and Finland $\Delta.S$
L $\Delta.S$	-0.14 (-1.37)	-0.42*** (-4.25)	-0.28*** (-2.83)	-0.25** (-2.50)
L2 $\Delta.S$	-0.27*** (-2.80)	-0.40*** (-4.01)	-0.38*** (-3.97)	-0.36*** (-3.68)
L $\Delta.F$	-0.53*** (-2.59)	-0.03 (-0.18)	0.08 (0.56)	0.00 (0.03)
L2 $\Delta.F$	-0.49** (-2.44)	-0.78*** (-4.07)	-0.57*** (-3.82)	-0.41*** (-3.54)
L3 $\Delta.F$	-0.41** (-2.05)	-0.20 (-1.01)	-0.15 (-0.95)	-0.16 (-1.41)
Δ .Bund-10y	-7.64 (-1.41)	-6.66* (-1.65)	-1.79 (-0.57)	-1.60 (-0.51)
L Δ .CDS_US_Banks	0.01 (1.27)	0.02** (2.10)	0.01 (1.45)	0.01 (1.56)
L2 Δ .CDS_US_Banks	0.01 (1.06)	0.01* (1.66)	0.00 (0.27)	0.01 (0.86)
Post Bear Stearns: Phase 2	-1.28 (-0.50)	-4.44 (-1.52)	0.68 (0.19)	-0.89 (-0.38)
Post Lehman	-0.20 (-0.08)	-4.18 (-1.43)	4.66 (1.34)	3.78 (1.62)
Bear Stearns-Phase 1*Debt_GDP	-0.02 (-0.60)	-0.02 (-0.65)	0.02 (0.38)	-0.01 (-0.24)
Bear Stearns-Phase 2*Debt_GDP	0.02 (0.75)	0.04 (1.26)	0.00 (0.03)	0.01 (0.24)
Lehman*Debt_GDP	0.07*** (2.75)	0.08*** (2.67)	-0.02 (-0.54)	-0.02 (-0.90)
Constant	0.71 (0.36)	2.11 (0.93)	-0.47 (-0.17)	0.78 (0.42)
Observations	172	172	129	172
R-squared	0.27	0.37	0.35	0.30
p-value for sum of F=0	0.00	0.01	0.03	0.01

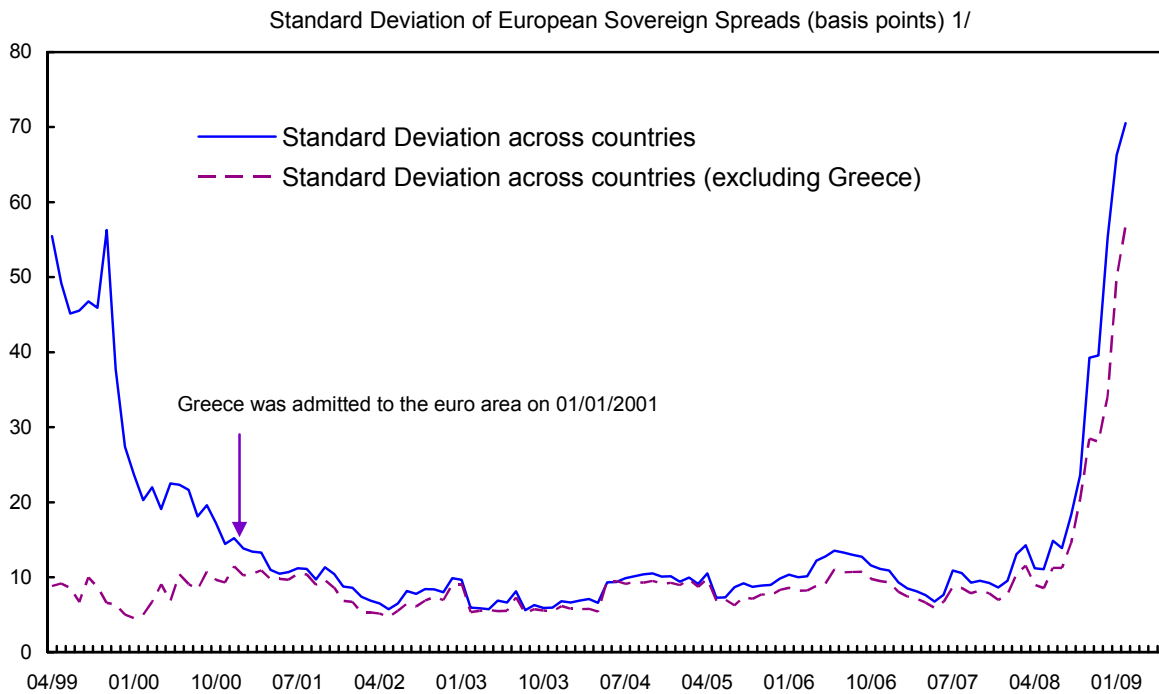
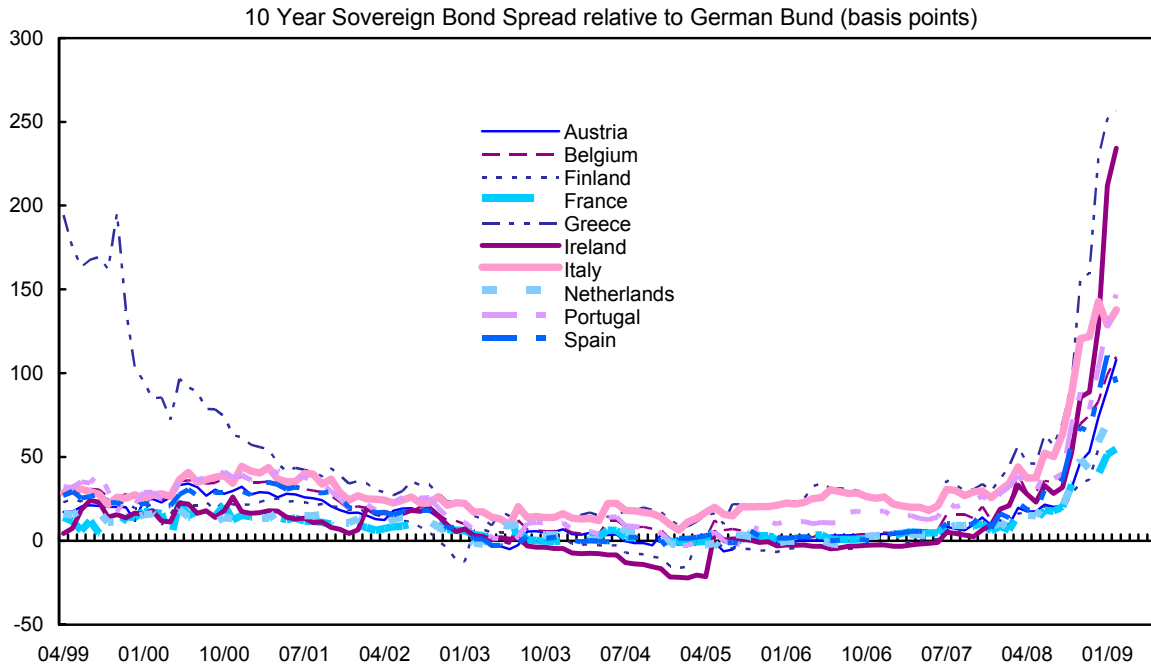
z-statistics in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Table 10. Post-Bear Stearns Country Variations: Monthly Data

VARIABLES	(1) Ireland, Greece, Spain, and Belgium $\Delta.S$	(2) Ireland, Greece, Spain, and Belgium $\Delta.S$	(3) Belgium, Italy, France, and the Netherlands $\Delta.S$	(4) Belgium, Italy, France, and the Netherlands $\Delta.S$	(5) France, the Netherlands, Austria, and Finland $\Delta.S$	(6) France, the Netherlands, Austria, and Finland $\Delta.S$
$\Delta.S$	-0.06 (-0.38)	0.03 (0.18)	-0.48** (-2.53)	-0.50*** (-2.72)	-0.15 (-0.70)	-0.11 (-0.51)
$\Delta.F$	-1.14*** (-3.28)	-1.02*** (-2.98)	-0.02 (-0.05)	-0.08 (-0.25)	-0.12 (-0.64)	-0.13 (-0.76)
$\Delta.F$	-0.72* (-1.86)	-0.44 (-1.14)	-0.70** (-2.58)	-0.74*** (-2.80)	-0.36** (-2.09)	-0.29* (-1.72)
$\Delta.Bund-10y$	-16.57 (-1.59)	-19.36* (-1.69)	-12.30* (-1.85)	-11.98* (-1.84)	-4.89 (-0.93)	-5.32 (-0.98)
$\Delta.CDS_US_Banks$	0.02 (0.83)	0.02 (0.74)	-0.00 (-0.17)	-0.00 (-0.12)	0.00 (0.18)	0.00 (0.30)
$\Delta.CDS_US_Banks$	0.03 (1.40)	0.03 (1.15)	0.02 (1.04)	0.02 (1.23)	0.01 (0.49)	0.01 (0.50)
Post Bear Stearns: Phase 2	-7.17 (-1.29)	-9.49 (-1.26)	-3.42 (-0.86)	-9.83 (-1.37)	-3.52 (-1.21)	-4.93 (-0.58)
Post Lehman	2.06 (0.35)	-6.86 (-0.92)	3.88 (1.00)	-10.50 (-1.58)	4.21 (1.38)	4.13 (0.52)
Bear Stearns- Phase 1*Debt_GD P		0.02 (0.33)		0.03 (0.43)		-0.02 (-0.21)
Bear Stearns- Phase 2*Debt_GDP		0.08 (1.11)		0.12 (1.51)		0.01 (0.12)
Lehman*Debt_GDP		0.17*** (2.71)		0.23*** (3.45)		-0.02 (-0.26)
Constant	14.09*** (2.75)	3.44 (0.73)	11.55*** (3.19)	2.81 (0.57)	5.69** (2.44)	4.41 (0.74)
Observations	44	44	44	44	44	44
R-squared	0.62	0.53	0.52	0.52	0.45	0.39
p-value for sum of F=0	0.00	0.00	0.07	0.03	0.02	0.01

z-statistics in parentheses, *** p<0.01, ** p<0.05, * p<0.1

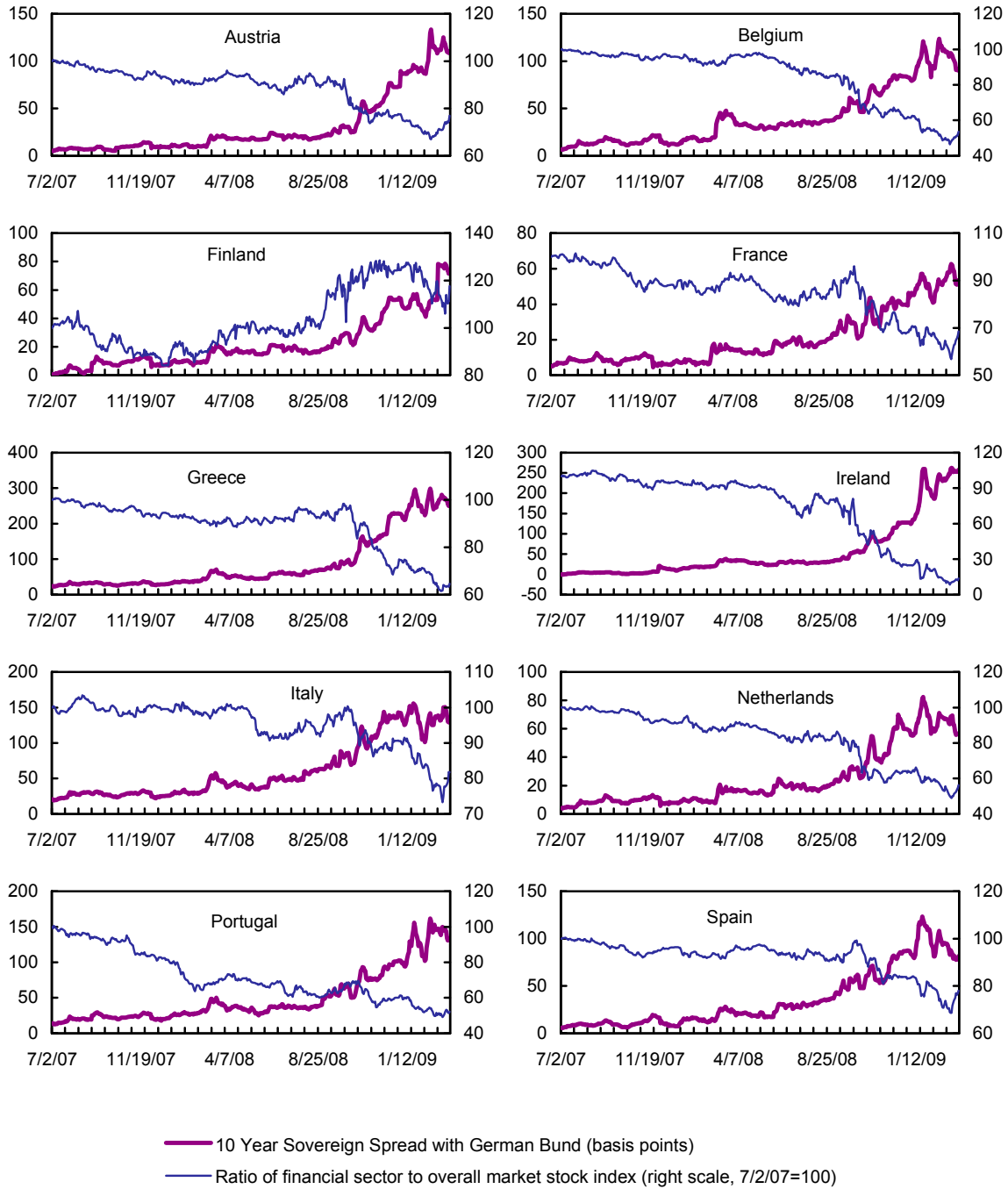
Figure 1. Trends and Dispersion of Eurozone Sovereign Spreads



Sources: Thomson Financial/DataStream and IMF, World Economic Outlook.

1/ As in Figure 1 (a) the countries include Austria, Belgium, Finland, France, Greece, Ireland, Italy, Netherlands, Portugal, and Spain.

Figure 2. Sovereign Spreads and Prospects of the Financial Sector



Source: Thomson Financial/DataStream.

Figure 3. Real Effective Exchange Rate Appreciation from January 2003 to July 2008

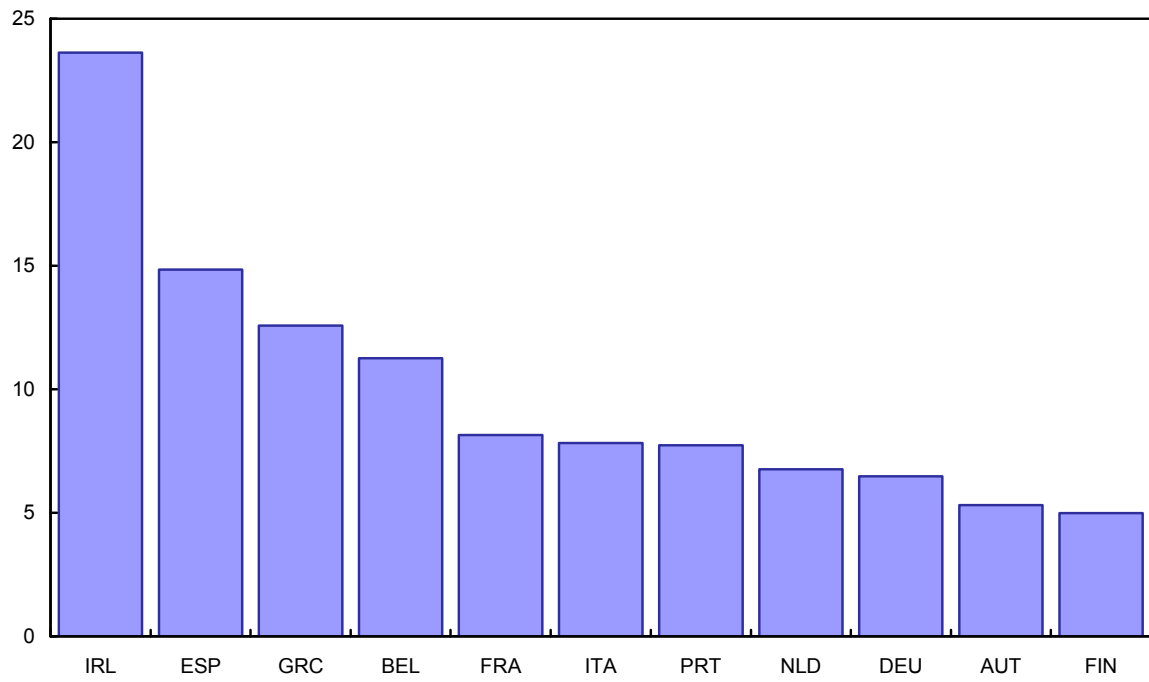
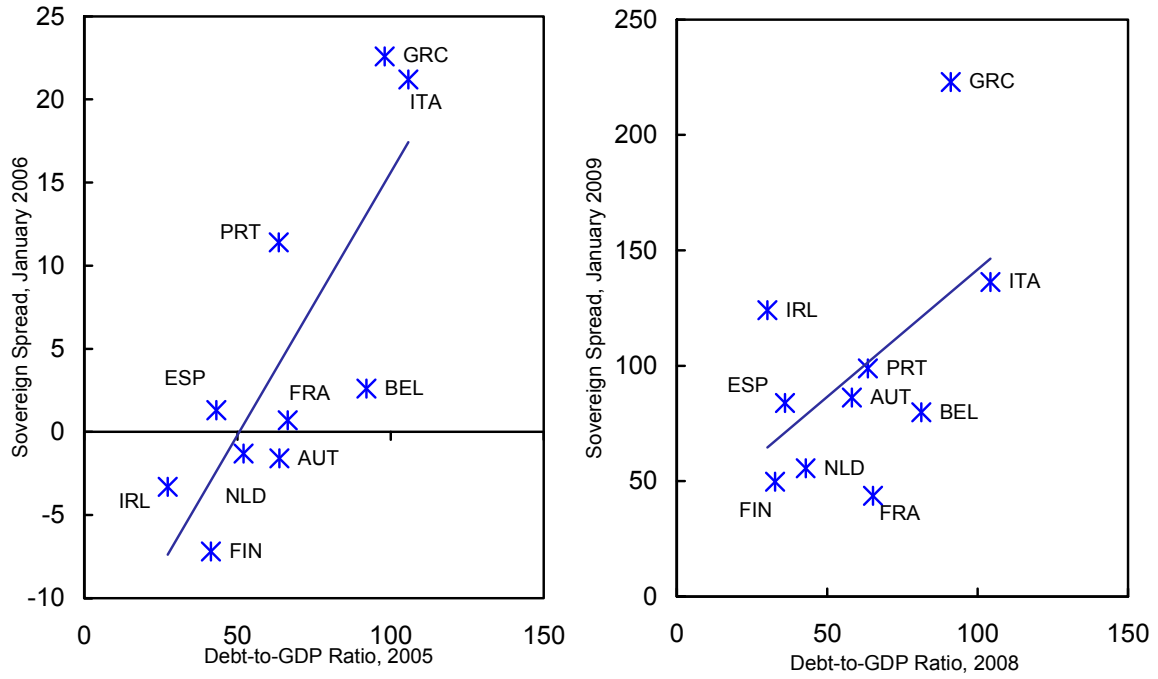
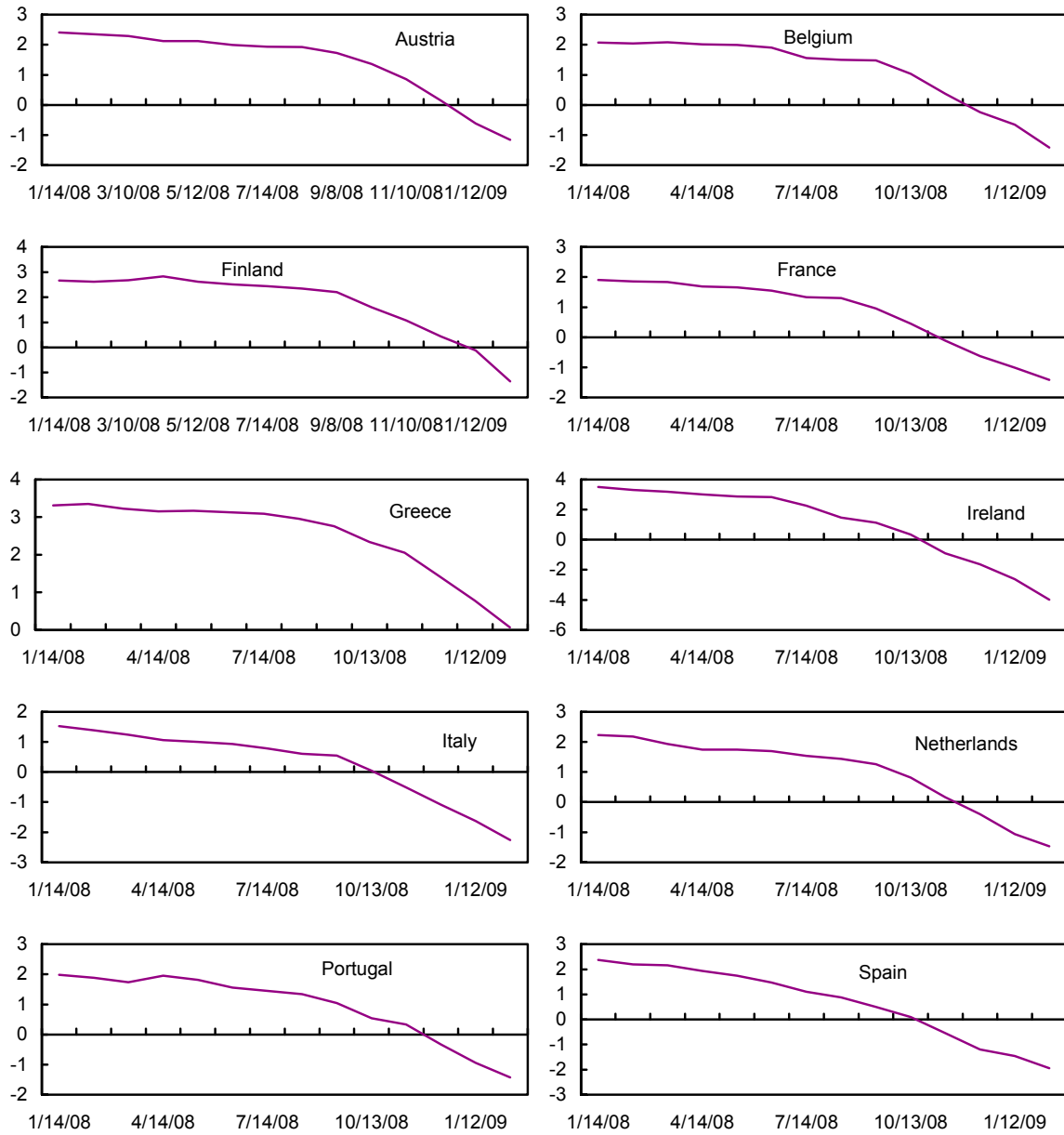


Figure 4. Correlation Between Debt-to-GDP Ratio and Sovereign Spreads



Sources: Thomson Financial; and IMF, WEO.

Figure 5. Eurozone: Evolving Real GDP Consensus Forecasts for 2009



Source: Consensus Forecast.

Figure 6. Change in Growth Projections for 2009 as F-Ratio Changed During 2008

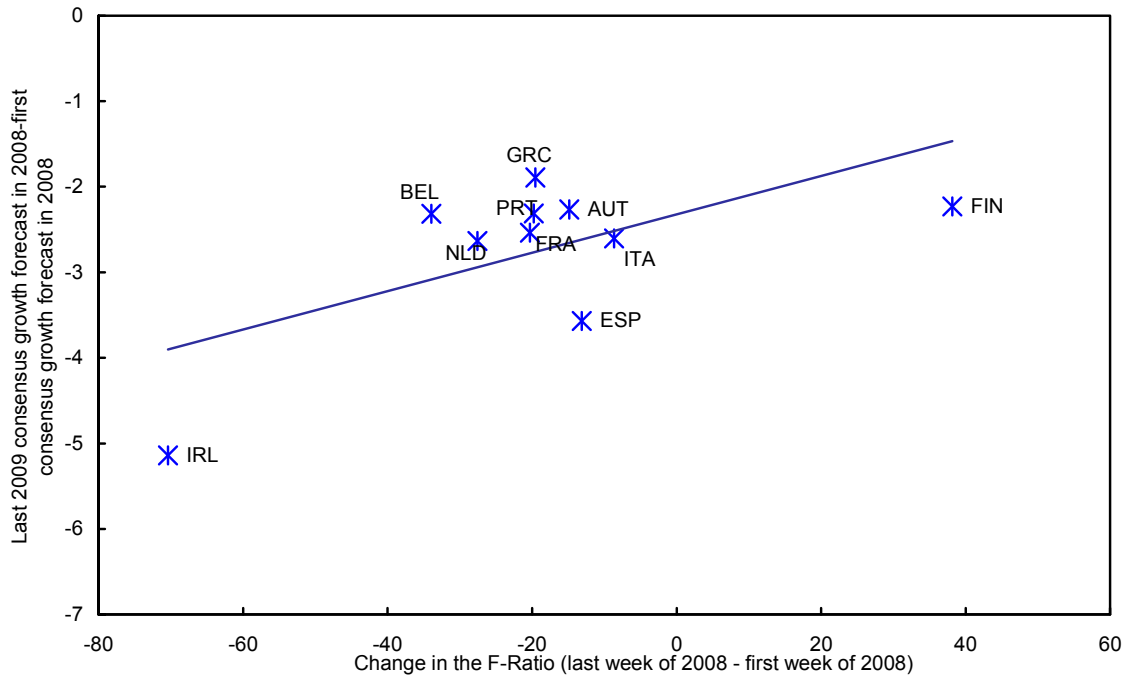
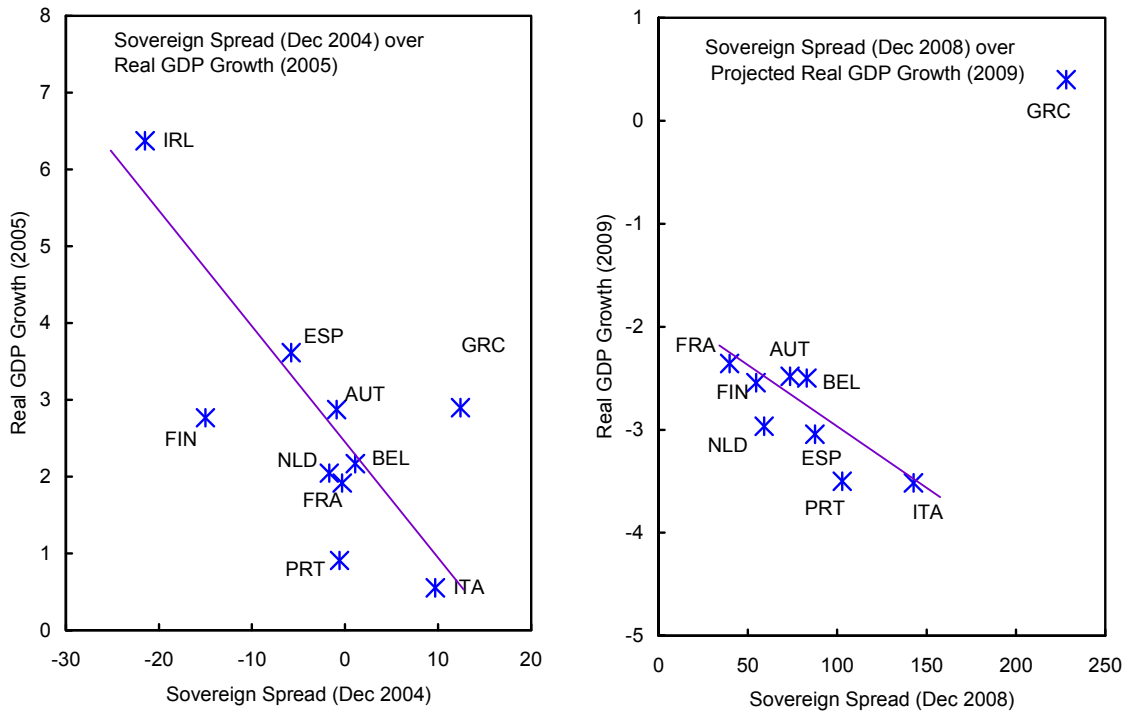
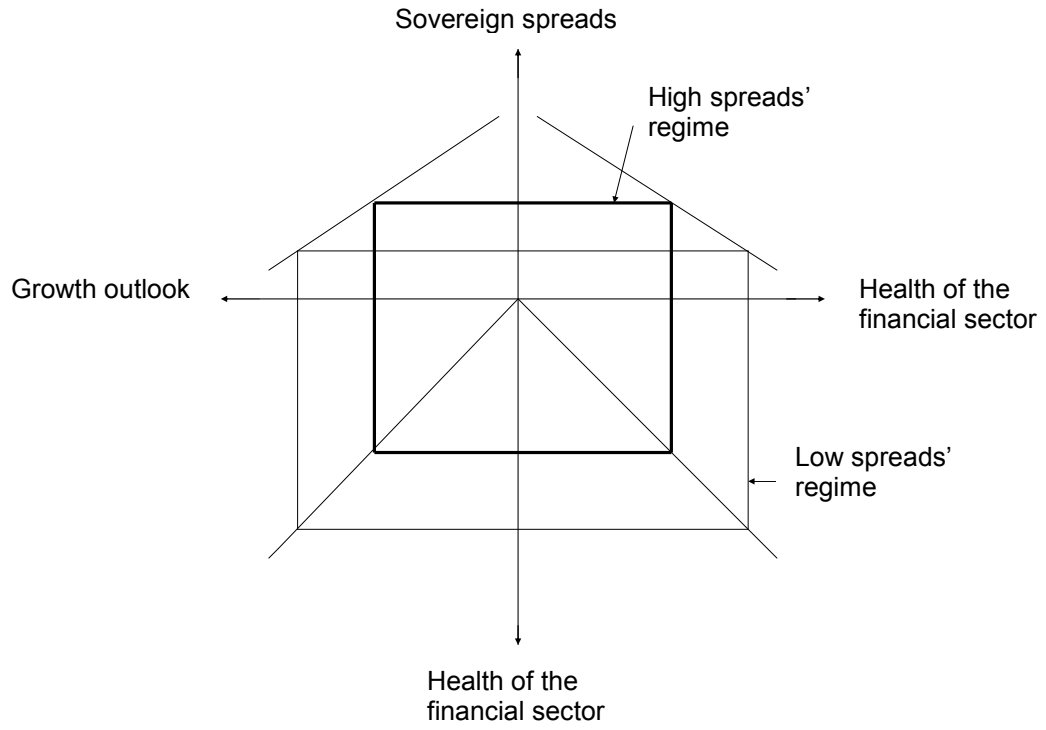


Figure 7. Do Sovereign Spreads Anticipate GDP Growth ? 1/



Sources: Thomson Financial/DataStream; and IMF, World Economic Outlook.
 1/ As in Figure 1 (a) the countries include Austria, Belgium, Finland, France, Greece, Ireland, Italy, Netherlands, Portugal, and Spain.

Figure 8. Regimes of High and Low Sovereign Spreads



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