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# THE ASIAN FLU AND RUSSIAN VIRUS: FIRM-LEVEL EVIDENCE ON HOW CRISES ARE TRANSMITTED INTERNATIONALLY

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The Asian Flu and Russian Virus: Firm-level Evidence on How Crises are Transmitted Internationally

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## ABSTRACT

This paper uses firm-level information to evaluate how crises are transmitted internationally. It constructs a new data set of financial statistics, industry information, geographic data, and stock returns for over 10,000 companies in 46 countries to test what types of firms were most affected by the East Asian and Russian crises. Results suggest that a product-competitiveness and income effect were both important transmission mechanisms during the later part of the Asian crisis and the Russian crisis. For example, if a firm's main product line competed with a major East Asian export, the firm's average daily abnormal stock return was 13 percent lower during the Asian crisis. The magnitude of this product competitiveness effect during the Russian crisis was 32 percent. Results suggest that a credit crunch was not important during either crisis. Finally, country-specific effects, which are poorly explained by macroeconomic and corporate governance variables, can have a larger impact than all other transmission mechanisms combined.

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# I. Introduction

The Asian flu. The Russian virus. The Tequila effect. Contagion. Numerous terms have been invented to explain the same basic phenomenon; a crisis in one country (or region) can affect markets of very different sizes and structures around the globe. While most people would agree that this phenomenon has occurred during at least one of the crises of the 1990's, there is little agreement on exactly why crises are transmitted internationally. For example, during the East Asian crisis, why did the Brazilian stock market index fall by 31 percent in October?[1] And why did the Australian and South African market indices fall by 14 percent over the same period? Why were these diverse markets so significantly affected by events in East Asia?

After the string of currency crisis in the 1990's, a number of papers have tried to answer these questions. Many papers have developed theories explaining how a crisis in one country can be propagated to markets in other countries. Other papers have used macroeconomic data to test the validity of these theories. This paper, however, takes a different approach to testing how crises are transmitted internationally. Instead of using aggregate, macro-level data, it utilizes firm-level information. Within any country, there is a large variation in how different companies are affected by a crisis elsewhere. Tests based on firm-level data can utilize this variation in individual company performance to help identify how shocks were transmitted during recent financial crises.

In order to perform this firm-level analysis, this paper constructs a new data set of financial statistics, industry information, geographic data, and stock returns for over 10,000 companies in 46 countries. It uses this information to test how individual company's stock market returns during the East Asian and Russian crises are affected by factors such as: industry; international exposure; debt quantity and structure; trading liquidity and/or geographic location. The paper presents preliminary graphical results, which show which types of companies were

[1] Based on market indices in US$ reported by Datastream.

most affected by these two crises, as well as more informative regression results, which estimate how different company characteristics simultaneously affect firm vulnerability to a crisis. Identifying which types of companies were (and were not) most vulnerable to these crises is not only interesting in and of itself, but also helps assess how these two crises were transmitted internationally.

Results suggest that a product-competitiveness effect was an important transmission mechanism during the later part of the Asian crisis and the Russian crisis. For example, if a firm's main product line was in the same industry as a major export from East Asia or Russia, its average daily abnormal stock return was 13 percent lower during the Asian crisis (compared to firms which did not compete with Asian exports). The magnitude of this product-competitiveness effect during the Russian crisis was 32 percent. Results also suggest that an income effect was an important transmission mechanism during the same two periods. For example, if a firm had direct exposure to East Asia or Russia (as measured by a significant share of sales, income or assets in the crisis region), its average daily stock return was 25 percent lower during the Asian crisis, or 101 percent lower during the Russian crisis (relative to daily abnormal returns for firms which did not have direct exposure to the crisis region.)

Results also indicate that a credit crunch was not an important propagation mechanism during either crisis period. Firms more reliant on short-term debt were not significantly more vulnerable to either crisis. Another key result is that during the later part of the Asian crisis, more liquid stocks had significantly lower returns than the rest of the sample. This could result from the crisis being transmitted through some sort of forced-portfolio recomposition. One theme which continually emerges from this series of results is that the relative importance of each propagation mechanism depends on the specific characteristics of the original crisis. A final result from both the Asian and Russian crises is that country-specific effects, which could reflect some sort of wake-up call, country revaluation, or country-specific events, can have a larger impact than all of

the other mechanisms combined. It is difficult to explain these large country-specific effects with a variety of macroeconomic and corporate governance variables.

The remainder of this paper is divided into six sections. Section II surveys the theoretical literature on the international transmission of crises and reinterprets much of this literature in the context of how individual firms could be affected by crises in other countries. It also discusses the aggregate empirical work testing these theories and how a firm-level analysis could augment this work. Section III describes the extensive firm-level data set which was compiled for this paper. Next, Section IV uses an event-study methodology to present a graphical analysis of stock returns for various portfolios after the East Asian and Russian crises. This univariate analysis has a number of econometric problems. Section V addresses these problems and estimates how different types of firms were affected by these two crises. It focuses on an estimation technique developed by Sefcik and Thompson. This section closes by taking a closer look at the large country-specific effects and tests if a number of macroeconomic and corporate governance variables can explain these effects. Section VI reports an extensive set of robustness tests and Section VII concludes with a number of caveats.

## II. Theory and Previous Evidence

Over the past few years, an extensive literature has explored how crises are transmitted internationally. Recent surveys of this literature have used a variety of different approaches toward coherently organizing this research and classifying potential propagation mechanisms.[2] This paper will draw on these approaches but use a slightly different framework and terminology in order to focus on the company-specific impact of crises. More specifically, this section explains that a crisis in one country could be transmitted to firms in other countries through five different channels: product competitiveness; an income effect; a credit crunch; a forced-portfolio

recomposition; or a wake-up call. After discussing the theoretical underpinnings of each of these transmission mechanisms, this section will survey the macroeconomic empirical work testing each mechanism's relative importance. It will conclude by discussing how a firm-level analysis can use the within-country variation in company performance to build on this macroeconomic work and help identify how recent crises were transmitted internationally.

## II.A Theory: How are Crises Transmitted Internationally?

The first channel through which a crisis in one country could be transmitted to firms in other countries is through product competitiveness.[3] If one country devalues its currency, then that country's exports will be relatively cheaper in international markets. Similar products from firms in other countries which are sold in the same markets (including the country which initially devalued) will be relatively less competitive. Moreover, if exports from the initial country are a large enough share of global production in a given industry, then industry prices could fall worldwide. Therefore, even if a company does not directly compete with firms from the crisis country in any specific markets, a product's competitiveness could be damaged by the currency crisis.[4]

A second mechanism by which a crisis in one country could be propagated internationally is through an income effect that lowers demand for a firm's product. When a country undergoes a financial crisis or negative shock of any type, economic growth generally slows, often to the point of a severe economic contraction. Income in the country will fall, and any firm which exports to that country will face reduced demand (as long as the firm's product is

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[2] For recent surveys of this literature, see Claessens, Dornbusch, and Park [1999] and Forbes and Rigobon [1999a].

[3] Gerlach and Smets [1995] developed the first formal model of these effects. They focus on how the collapse of a currency affects the competitiveness of economies whose currencies remain pegged. Corsetti, Pesenti, Roubini and Tille [1998] provide a recent extension of these ideas based on micro-foundations.

[4] There could be "secondary-product competitiveness" effects if exports from the country which devalued are used as inputs in the production of goods in other countries. In this case, the currency crisis could improve the competitiveness of these other products.

not an inferior good.) This income effect will be magnified if the country's currency is devalued, since a devaluation would further reduce purchasing power and real income levels.

A third channel by which firms can be affected by crises in other countries is through a credit crunch. There are several different variants of this theory, but underlying them all is the idea that a crisis in one country leads to a sharp reduction in the supply of credit, reducing financial liquidity and generating an excess demand for credit at the prevailing interest rates. In one model of this mechanism, Goldfajn and Valdés [1997] focus on financial intermediaries that supply liquid assets to foreigners.[5] They show how a financial shock to one country can cause investors in that country to withdraw their deposits, reducing the liquidity of financial intermediaries and forcing them to liquidate loans to firms in other countries and/or be unable to renew their financing in the future. Although most models of a credit crunch aim to explain macroeconomic phenomena such as the spread of banking crises or speculative attacks, the implication for individual companies is straightforward. A shock to one country could lead to a credit crunch for firms in other countries, making it difficult for the firms to obtain new financing and/or renew old loans.

A fourth, and closely related, channel by which crises could be transmitted internationally is through a forced-portfolio recomposition. Valdés [1996] is one of the first papers to discuss this channel in detail.[6] He focuses on the behavior of individual investors after a shock to one market. A shock could reduce the liquidity of the investors and force them to sell assets in other markets in order to meet certain requirements. More specifically, the investors may need to sell assets in other markets in order to satisfy margin calls, to continue operating in the market, and/or to meet

[5] Other models showing how a credit crunch can propagate a crisis across countries include: Chang and Velasco [1998], which focuses on the maturity mismatch of a financial system's international assets and liabilities; and Kaminsky and Reinhart [1998], which shows how commercial banks with lending concentrated in a crisis-stricken region could be forced to withdraw lending in other regions in order to maintain solvency. Caballero and Krishnamurthy [1999] develop a model which focuses on the domestic implications of a credit crunch. They show how under-developed financial markets can drive asset valuations below fundamentals, thereby limiting domestic banks access to international financial markets and causing a credit crunch, which further reduces the value of domestic assets.

[6] For recent theoretical work on this portfolio-recomposition channel, see Schinasi and Smith [2000].

regulatory requirements. Kaminsky et al. [2000] extend this framework to mutual funds and argue that a crisis in one market might cause institutional investors to sell liquid assets in other markets in order to raise cash to fulfill investor redemptions.

A final channel by which a country-specific crisis can be transmitted to firms in other countries is through a wake-up call effect (which is also called country reevaluation). The basic idea behind this set of theories is that a crisis in one country (or investor behavior in one country) can provide information about other countries (or how investors will behave in other countries.) One group of theories in this category focuses on the reassessment of macroeconomic fundamentals. If a country with certain macroeconomic characteristics (such as a weak banking sector) is discovered to be susceptible to a currency crisis, then investors will reassess the risk of other countries with similar macroeconomic fundamentals. A related group of theories focuses on investor behavior and information asymmetries, which can lead to herding or informational cascades.[7] These theories are often referred to as contagion and most predict multiple equilibria.[8] Although each of these wake-up call theories focuses on how a crisis in one country is transmitted to other countries, the impact on individual firms is straightforward. If a shock is transmitted to a second country through this channel, then all firms in the second market should be affected, and firm characteristics should not be significant.

This section discusses five potential transmission mechanisms--product competitiveness, an income effect, a credit crunch, a forced portfolio recomposition, and a wake-up call. It is worth noting that these channels are not mutually exclusive and could overlap in important ways. For example, if a crisis in one country generates a wake-up call effect that causes investors to lose confidence in another country, the second country may raise interest rates in order to reduce the

[7] For examples, see Banerjee [1992], Shiller [1995], Masson [1997], Calvo and Mendoza [1998], Chari and Kehoe [1999] and Tornell [1999]. This includes "political contagion" such as that modeled in Drazen [1998].

[8] Although the term "contagion" is widely used, there is little agreement on what exactly it means. See Forbes and Rigobon [1999a] for a lengthy discussion of how the term is misused and a proposition for how it should be defined.

resulting capital outflow. The higher interest rates could in turn cause a credit crunch. It is also worth noting that the relative importance of each propagation mechanism will depend on the specific characteristics of the original country (or region) which experiences the crisis. For example, if a country has a small share of exports in global markets, a devaluation of that country's currency would be unlikely to generate a significant product-competitiveness effect. Similarly, if relatively few foreign banks have made loans to firms in a given country, then a crisis in that country would not be expected to generate a global credit crunch.

A final point on this discussion of transmission mechanisms is that this overview completely ignores several equally important, albeit related, topics. For example, this paper assumes that the initial country-specific crisis is given, and does not explore the timing or cause of the initial shock. It also ignores the possibility that a "monsoonal" or global shock, such as rise in the global cost of capital, occurred which affected several countries simultaneously.[9] In order to focus on how crises are transmitted to firms around the world, this paper will leave these subjects for future work. It will take the initial shock as given and focus only on episodes where this initial shock is isolated to a specific country or region.

## II.B Previous Evidence: How Are Crises Transmitted Internationally?

Several papers have used macroeconomic statistics to attempt to measure the importance of one (or more) of these five transmission mechanisms. These papers have examined a variety of different crises periods, included an assortment of countries, and used a range of statistical techniques. Not surprisingly, the results have been mixed.

Tests of the first two transmission mechanisms (product-competitiveness and income effects) are often lumped together as tests of "trade". Papers by Eichengreen, Rose, and Wyplosz [1996] and Glick and Rose [1999] argue that currency crises are spread across countries mainly

[9] Masson [1997] introduces the term "monsoonal" to describe global shocks.

through international trade linkages and not through a revision of expectations based on macroeconomic similarities. Papers by Masson [1997] and Baig and Goldfajn [1998], however, argue that trade linkages were not significant transmission mechanisms during recent crises because these linkages (both direct and in third markets) were small.

Tests of the third transmission channel, a credit crunch, also yield mixed results.[10] Peek and Rosengreen [1997] find evidence of reduced lending by Japanese banks in the US after the 1990 Japanese stock market crash. Kho and Stulz [1999] argue that major events during the Asian crisis had little significant impact on stock returns of Western banks. Kim [1999] and Ghosh and Ghosh [1999] both estimate disequilibrium models of bank loans during the Asian crisis. The first of these papers concludes that there was evidence of a quantity rationing causing a credit crunch, while the second paper concludes that there was not.

Several papers have also tested the importance of the fourth transmission mechanism--a forced-portfolio recomposition. Valdés [1996] finds supportive evidence in markets for sovereign debt during the Mexican peso crisis, and Frankel and Schmukler [1998] report further support from closed-end fund data during the 1994 Mexican peso crisis. Kaminsky et al. [1999] find evidence of a forced-portfolio recomposition from individual portfolios during the Mexican, East Asian and Russian crises. Other papers, however, argue that recent crises did not spread through this channel, since net redemptions and capital outflows by mutual fund investors were small during the Mexican and East Asian crises.[11]

Most empirical tests of the fifth transmission mechanism, wake-up calls, have focused on the importance of country reevaluation based on macro-fundamentals rather than on "contagion" such as herding and/or information cascades. Sachs, Tornell, and Velasco [1996] and Tornell [1999] argue that three country fundamentals (real exchange rate overvaluation, banking system fragility, and low international reserves) have a significant impact on the probability of a crisis

[10] Also see Ding, Domac, and Ferri [1998].
[11] For example, see Rea [1996] and Froot, O'Connell and Seasholes [1998].

occurring. Boone, Breach, Friedman and Johnson [2000] report that corporate governance measures, such as the effectiveness of protection for minority shareholders, are more significant than these macroeconomic measures in explaining the occurrence of the Asian crisis. Baig and Goldfajn [1998] find further evidence of country reevaluation and/or herding effects. Kaminsky and Schmukler [1999] argue that some of the largest one-day swings in stock prices during the Asian crisis can not be explained by news, but instead "seem to be driven by herd instincts of the market itself." While this set of papers suggests that wake-up calls are an important propagation mechanism, Eichengreen, Rose, and Wyplosz [1996] and Glick and Rose [1999] argue that macroeconomic similarities do not play a significant role. As discussed above, they argue that trade is far more important than country reevaluation in the international transmission of crises.

A final series of tests for how shocks are transmitted internationally uses a very different approach and does not easily fit into the five classifications utilized in this paper. This approach categorizes propagation channels as crisis-contingent or non-crisis contingent, based on whether the transmission mechanism changes significantly after a shock. Crisis-contingent channels include credit crunches, portfolio recomposition, and some types of wake-up calls (such as herding). Non-crisis contingent channels include product competitiveness, income effects, and other types of wake-up calls (such as country reevaluation.) Papers based on this approach test if correlations in cross-market returns increase significantly after a crisis. Calvo and Reinhart [1996] and Baig and Goldfajn [1998] use this approach and find some evidence of contagion during the Mexican and Asian crises, respectively. Forbes and Rigobon [1999b], however, adjust for a bias in the correlation coefficient and argue that no contagion occurred during recent crises.[12]

[12] Rigobon [1999] extends this analysis to address a potential endogeneity problem and reports similar results.

### II.C Firm-level versus Macro Tests of International Transmission Mechanisms

This literature review has surveyed the range of work examining how crises are transmitted internationally. This review has shown that the empirical literature is far from reaching any sort of consensus. Nonetheless, this body of work has provided a useful framework for evaluating how crises are propagated, as well as a preliminary set of results for assessing the relative importance of these various transmission mechanisms.

These tests based on macroeconomic data, however, ignore a tremendous wealth of information which is lost in the aggregation used to create the macroeconomic statistics. Within each country, there is a large variation in how different companies are affected by financial crises. For example, if a devaluation in one country increases the competitiveness of its exports, firms in other countries should only be directly affected by the devaluation if they sell products which compete with those exports. Companies which produce non-traded goods should be less affected by the devaluation. Similarly, if a crisis in one country leads to a global credit crunch, firms which are more dependent on short-term loans to finance current operations should be more vulnerable to the increased cost of credit. Empirical studies which simply look at a country's aggregate trade statistics, balance of payments, or total market returns, will ignore these important differential effects across firms. Utilizing firm-level information could be extremely useful in identifying how crises are transmitted internationally and in evaluating the relative importance of these various propagation mechanisms.

## III. The Firm-Level Data Set

The obvious difficulty with utilizing firm-level information to identify how crises are transmitted internationally is that these micro-level tests require a larger data set composed of less readily-available statistics. To construct this firm-level data set, I began by compiling balance sheet, income statement, cash flow, and general company information from the Worldscope

database.[13] Worldscope contains information on approximately 16,000 companies from 51 countries, representing about 90 percent of global market capitalization (according to their literature). Records begin as early as 1980 for many companies, and include historical information on firms that became inactive due to a merger, bankruptcy, or any other reason. Worldscope reports both the original data as reported by each company, as well as templated figures which have been adjusted to account for any cross-country variation in accounting practices. The templated figures are designed to be directly comparable across national boundaries. I compiled Worldscope information on all available companies for the one-year preceding the 1997 East Asian crisis and the 1998 Russian crisis. Then I matched this information with data on daily stock returns from Datastream [14] and excluded the five countries that had information for fewer than 10 firms.[15] Finally, since this paper utilizes stock returns to evaluate how companies are affected by various crises, I exclude any firm whose stock is not actively traded.[16]

The resulting data set includes information for 46 countries, with 11,422 companies for the East Asian crisis and 10,235 companies for the Russian crisis. Table I lists the number of companies in each country and region for each of the periods. As the table shows, there is extensive coverage of companies in the Americas, Asia, Austral-Asia, and Europe, but there is limited coverage of Africa and the Middle East. Table II lists median market capitalization and net income by region, as well as the total number of companies by industry group.[17] Appendix A

[13] The Worldscope data base is produced by Disclosure, which is part of the Primark Global Information Services Group. For further information, see the website: http://www.primark.com.
[14] Returns are calculated as the difference in logs and are not adjusted for inflation. Returns were also adjusted for weekends, with no significant impact on the results.
[15] Countries excluded are: Liechtenstein, Russian Federation, Slovakia, Sri Lanka, and Zimbabwe.
[16] Actively-traded stocks are defined as stocks with non-zero returns for at least 50 percent of the trading days during the given period. I also exclude any stocks which are delisted (due to bankruptcy, merger, or any other reason) during the given period. Reasonable modifications to this definition have no significant impact on results. As shown at the bottom of Table II, this "actively traded" criterion eliminates a significant number of companies from the original sample.
[17] I focus on median statistics since means tend to be skewed by several extreme outliers. These outliers undoubtedly represent reporting and/or measurement error and are adjusted for in the empirical analysis.

lists the statistics available for each firm and includes detailed information on how each variable is defined and/or calculated.

This firm-level data set has detailed information on a wide range of companies from around the world. There are, however, several limitations with this data. First, since Worldscope only reports information which is publicly available, virtually all of the sample consists of publicly-traded companies. Most private and government-owned companies are not included. As a result, countries where many firms tend to be majority-owned by the state (such as China) tend to be underrepresented. Also, smaller firms, which are more likely to be privately owned, are underrepresented. These problems are magnified by the requirement that all firms in the sample are actively traded. A second problem is that although Worldscope attempts to correct for major differences in cross-country accounting standards, significant differences may still exist for certain variables. The analysis below addresses this problem by using a number of different statistics to test each hypothesis and by examining the impact of country-specific effects on the results.

A third problem with this data is that there are a number of extreme outliers which undoubtedly represent reporting errors. The analysis below addresses this problem by not only utilizing estimation techniques which minimize outliers, but also by performing an extensive set of sensitivity tests. Fourth and finally, Worldscope coverage of non-US companies before 1995 is more limited and much less comprehensive. Therefore, it is difficult to extend this analysis to earlier periods (such as the 1994 Mexican peso crisis) and it is only possible to evaluate the relative importance of the various transmission mechanisms during recent crises.

## IV. Graphical Analysis

This section uses this firm-level data set to construct a series of graphs showing preliminary evidence of how different types of companies were affected by the Asian and Russian

crises. The first part of this section explains the basic event-study methodology and estimates a market model of normal stock returns before each crisis. It then uses these estimated coefficients to calculate abnormal returns and cumulative abnormal returns for each stock after each crisis. The second part of this section aggregates these abnormal returns into different stock portfolios to examine the strength of the various propagation mechanisms discussed above. Graphs of these various portfolios provide preliminary evidence of which groups of companies were more vulnerable to the East Asian and Russian crises, and therefore how these shocks were transmitted internationally.

## IV.A Methodology

In order to construct these graphs, I follow the standard event-study methodology outlined in MacKinlay [1997]. To calculate normal returns for the sample of stocks discussed in Section III, I utilize a market model.[18] More specifically, for the pre-crisis period of length *P*, I use OLS to estimate the standard model:

(1)
$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it}$$
$$E(\varepsilon_{it}) = 0 \qquad var(\varepsilon_{it}) = \sigma^2_{\varepsilon_i}$$
$$i = 1,2....N$$
$$t = 1,2....P$$

where $R_{it}$ is the period-*t* return (based on local currency prices) for stock *i;* $R_{mt}$ is the period-*t* global market return[19]; $\varepsilon_{it}$ is the disturbance for stock *i* over period *t;* and the model is calculated for *N* firms and *P* periods.

[18] Results are virtually identical to those obtained with a constant-mean-return model (which are reported in the sensitivity analysis).

[19] The global market return is calculated using daily prices in local currency reported by Datastream for each country's market index. Weights for the global index are based on total market capitalization at the end of the year prior to the crisis (as reported in International Finance Corporation [1999].)

To estimate equation 1, I define the pre-crisis period (of length *P*) as the one-year before the "events" of the Russian and East Asian crises. I define the Russian crisis as starting on August 17, 1998 because this is the date that the government devalued the ruble and imposed a forced restructuring of its government debt.[20] I define the earliest stage of the Asian crisis as starting on June 25 1997, because this is date that the Thai government removed support from a major finance company (implying that creditors could incur losses) and reported that the government's stock of international reserves was grossly overstated. [21] These events prompted a massive speculative attack on Thailand which forced the government to float the baht on July 2nd. Admittedly, the Asian crisis had several different phases, and the analysis below will examine the behavior of stock portfolios during these different phases. For each phase, however, I continue to use the same one-year window ending on June 24th to estimate normal returns, so that estimates are not contaminated by unusual stock movements in earlier phases of the crisis.

Next, I utilize the parameter estimates from equation 1 during the pre-crisis period to calculate abnormal returns for each stock after the crisis. I define the Russian crisis as lasting for two weeks (ending on August 31, 1998) and I define two phases of the Asian crisis. The first phase is the period when the lower-income Asian economies (Indonesia, Malaysia, the Philippines, and Thailand) were subject to speculative attacks and forced to float their currencies. I define this period as lasting for 12 weeks (ending on September 16, 1997) and call this period "Asia-Phase 1." The second phase is the period when the higher-income Asian economies (Hong Kong, Korea, Singapore, and Taiwan) also were subject to speculative attacks and experienced significant declines in the values of their currencies (except Hong Kong). I define this period as starting on October 1 and lasting for 12 weeks (ending on December 24, 1997). I name this

[20] More specifically, on August 17th the Russian government raised the band for the ruble exchange rate, defaulted on its treasury bills, and declared a ninety-day moratorium on foreign debt payments. The currency did not officially float until August 27th.

[21] As recently as May of 1997, the Thai government had pledged public commitment to support Finance One. Reneging on this promise threatened the extensive system of government backing (both implicit and

period "Asia-Phase 2." It is obviously possible to use different definitions for each of these crisis periods so the sensitivity analysis performs a detailed analysis of the impact of modifying these period definitions.[22]

Using these definitions, the abnormal return ($\hat{\varepsilon}_{i\tau}$) for firm *i* during time $\tau$ of the crisis period (i.e. event window) of length *C* is therefore:

$$\hat{\varepsilon}_{i\tau} = R_{i\tau} - \hat{\alpha}_i - \hat{\beta}_i R_{m\tau} \qquad with\ \tau = 1,2....C \tag{2}$$

where each of the fitted parameters is estimated by equation (1) during the pre-crisis period. I continue to exclude any stocks which are not actively traded (as defined above) during the crisis period. Finally, I add the abnormal returns for each stock over any period *L* (with $L \leq C$) to calculate the cumulative abnormal returns (CARs):

$$CAR_{i,L} = \sum_{\tau=1}^{L} \hat{\varepsilon}_{i\tau} \tag{3}$$

These CARs are utilized in the graphs for the remainder of this section.

## IV.B Graphical Results

Once the CARs have been calculated for each stock, it is possible to compare different stock portfolios to see which types of firms were more vulnerable to the East Asian and Russian crises. As discussed in Section II, there are five channels by which each crisis could have been transmitted to firms in other countries: product competitiveness; an income effect; a credit crunch; a forced-portfolio recomposition; or a wake-up call. Although data availability and

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explicit). See Radelet and Sachs [1998] or Corsetti, Pesenti, and Roubini [1998] for a detailed accounting of key events in the Asian crisis.

[22] These crisis periods (and especially the 12-week periods for the two stages of the Asian crisis) are long for an event window, especially if markets are efficient and immediately reflect any information from the crises. I utilize these longer windows since new information was continually being provided (such as the collapse of the Indonesian rupiah after the initial collapse of the Thai baht). This stream of events which unwound slowly over several months provided critical information on the extent and severity of the crisis.

econometric problems make it impossible to construct definitive tests of each of these channels, graphs of different stock portfolios can provide preliminary and suggestive evidence.

The first transmission channel, product competitiveness, argues that if a crisis country devalues its currency, its exports will gain a competitive advantage. Therefore, after the crisis, firms which compete with major exports from the crisis country should experience lower returns than companies which do not compete in those sectors. To test this channel, I define "major exports" from the crisis zone as the four-digit SITC groups for which total exports from countries in the crisis zone are 20 percent or more of total exports in the entire world.[23] By focusing on total exports from the crisis zone (instead of total production), I implicitly exclude goods which would not be expected to experience competitiveness effects because they are non-traded, have high transport costs, and/or are subject to any sort of trade restrictions. Table III lists the SITC groups and the corresponding SIC categories that are "major exports" for each crisis zone--i.e. industries which could experience a competitiveness effect from each phase of the Asian crisis and the Russian crisis. Granted, this classification procedure is not a precise measure of competitiveness and has a number of problems,[24] but it does provide a rough approximation of what industries are most likely to be affected by the crises. Moreover, the sensitivity analysis shows that modifications to this competitiveness indicator have a minimal impact on results.

Next, I use the four-digit SIC codes listed in Table III to divide the firms in my data set into two portfolios for each crisis: companies whose primary output competes with exports from the crisis zone (i.e. is in the same 4-digit SIC group) and companies whose primary output does

[23] The crisis zone for Asia-Phase 1 is defined as: Indonesia, Malaysia, Philippines, and Thailand. The crisis zone for Asia-Phase 2 is defined as: Hong Kong, Indonesia, Korea, Malaysia, Philippines, Singapore, Taiwan, and Thailand. The Russian crisis zone is simply Russia. Information on exports by SITC group is taken from International Trade Centre/UN Statistics Division [1999]. Export information is for the full year preceding the relevant crisis.

[24] One problem is that different countries could produce goods of varying quality within the same 4-digit category and therefore not compete directly. Another problem is that all firm sales are included under the firm's primary SIC code and companies could simultaneously produce in other sectors. A third problem is that some of the SIC codes available for each company do not directly correspond to the SITC codes available for each country. A final problem is that SITC export information is not available for Taiwan. As

not compete.[25] Figures I through III graph the CARs of each portfolio over time for each crisis period, as well as the one-week before each crisis. The horizontal axes are labeled in event time, with the dashed line at zero indicating the starting date of the relevant crisis. Figure I shows no evidence of a product-competitiveness effect during the first phase of the Asian crisis. Firms which produced in the same four-digit SIC groups as the major exports from the low-income Asian economies did not experience significantly lower returns than other firms in the sample. Figure II shows a strong competitiveness effect during the second phase of the Asian crisis (with the largest impact in November and December when Korea was under attack.) Firms which competed with major Asian exports had average abnormal returns over 11 percent lower than average abnormal returns in the rest of the sample (for the entire 60-day period). Figure III shows some evidence of a competitiveness effect during the later part of the Russian crisis, where firms which competed with major Russian exports had average abnormal returns about 3 percent lower (for the entire 10-day period).

The second channel through which crises could be transmitted internationally is an income effect. A country (or region) suffering from a crisis generally experiences lower growth rates and a contraction of aggregate demand, which reduces the profitability of firms which sell in that country (or region.) To test this channel, I calculate the percent of sales, operating income, and assets each firm has in Russia and the relevant Asian-crisis countries during the one year preceding the relevant crisis. This classification procedure is not precise, since many companies report sales, income and assets by region instead of by country, but it does provide a useful proxy of a firm's direct exposure to the crisis zone.[26] Then, for each variable, I divide the sample into

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a result, I do not include Taiwanese exports in my calculation of major exports during the second phase of the Asian crisis.

[25] Throughout this section, reported results are based on equally-weighted portfolios. Estimates based on market-weighted portfolios are not significantly different. Also, I do not include firms from the relevant crisis area in either portfolio for two reasons. First, these firms are not relevant to this paper's investigation of how a crisis in one country affects firms in other countries. Second, crises could affect local firms differently, such as increasing the competitiveness of their exports instead of decreasing it.

[26] Russia is often grouped with Europe and individual Asian countries are often grouped together as Asia. In order to be consistent, I only include exposure that is specifically linked to the relevant country. For

two portfolios: firms which have direct exposure to the crisis zone (defined as at least 5 percent of assets, sales, or net income in the region) and firms which do not have direct exposure. I continue to exclude firms that are based in the relevant crisis zone.

The CARs for each portfolio are graphed in Figures IV through VI. Figure IV shows that returns for firms with direct exposure to the low-income Asian economies were slightly lower than for the rest of the sample. This could indicate a small income effect. Figures V and VI, however, show a strong income effect during the second phase of the Asian crisis and the Russian crisis. Firms with direct exposure to the Asian-crisis countries experienced abnormal returns about 18 percent lower than average abnormal returns for the rest of this sample. Firms with direct exposure to Russia had abnormal returns about 16 percent lower than for the rest of the sample.

The third channel by which a crisis in one country could be transmitted to firms in other countries is a credit crunch. As discussed in Section II, there are several different variants of this theory, but underlying them all is the idea that a crisis in one country leads to a sharp reduction in the international supply of credit, raising the cost of credit to firms in other countries. A direct implication of this theory is that companies which rely more heavily on short-term debt to finance inventories and provide working capital would be more affected by a crisis. To test this theory, I use each firm's ratio of net short-term debt to equity to divide the sample of firms into two portfolios: those more highly dependent on short-term financing and those less dependent.[27]

Figures VII through IX graph the CARs for the two crisis periods. These figures show little evidence of a credit crunch. In fact, during the second phase of the Asian crisis and the Russian crisis, firms which were more dependent on short-term debt had slightly higher abnormal

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example, for the first stage of the Asian crisis, I only include sales, income, or assets which are specifically labeled as occurring in Indonesia, Malaysia, the Philippines, or Thailand. I do not include sales, income, or assets labeled as occurring in "Asia".

[27] The sensitivity analysis uses another measure of short-term-debt and total-debt dependence to construct these portfolios. Results do not change significantly. For each crisis, I use the sample median as the

returns than the rest of the sample--the opposite of what would be expected during a credit crunch. It is worth noting that these comparisons are very rough tests of a credit crunch, since firms more reliant on short-term debt could experience lower returns during the crisis for other reasons. For example, firms more dependent on short-term debt financing could be smaller, riskier, and/or more highly leveraged. Since these types of firms could be more vulnerable to a crisis for reasons other than a credit crunch, it is surprising that the difference between stock portfolios in Figures VII through IX is not greater.

A forced-portfolio recomposition, the fourth transmission channel, suggests that after a crisis investors may need to sell assets in markets not directly affected by the crisis in order to meet certain requirements. It is impossible to test this propagation mechanism directly using this paper's firm-level data set. One implication of this set of theories, however, is that a company would be more vulnerable to a forced sell-off if a larger percent of its shares is held by institutions (such as mutual funds) that could be subject to the regulatory requirements or cash redemptions which cause this type of portfolio recomposition. Moreover, Falkenstein [1996] shows that mutual funds tend to bias their investment toward more liquid stocks. Therefore, since more liquid stocks tend to have a higher share of institutional ownership, they may be more susceptible to a forced-portfolio recomposition. To test this channel, I calculate each stock's liquidity as the percent of trading days for which stock returns are non-zero (in the pre-crisis period). Then, I define highly-liquid stocks as those for which returns are non-zero in at least 75 percent of the pre-crisis trading days.[28] All other stocks are classified as less liquid (but due to the requirements discussed in Section III, are still "actively traded".)

Figures X through XII graph the CARs for portfolios of highly-liquid and less-liquid stocks for each crisis. During the first phase of the Asian crisis and the Russian crisis, there is little difference between the two portfolios. During the second phase of the Asian crisis, however,

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division between more-dependent and less-dependent firms. The sample median of net short-term debt to equity is 0.70 percent during the East Asian crisis and 0.56 percent during the Russian crisis.

highly liquid stocks have average returns about 6 percent lower than the less-liquid stocks. Although stock liquidity is a very rough proxy for capturing any sort of portfolio-recomposition effect, these results do suggest that this transmission mechanism could have been important during the second phase of the Asian crisis.

The final channel by which a shock to one country could be transmitted to firms in other countries is a wake-up call or country reevaluation. This transmission channel incorporates a number of different theories, and once again, it is difficult to test this transmission channel directly using this paper's firm-level data set. Each variant of these theories, however, has one important implication: a crisis in one country causes investors to pull out of all the companies in another country or region. As a result, most of the movement in individual stock prices should mirror movement in the aggregate country stock indices. Firm characteristics should have no significant effect on firm performance.[29] As a rough test of this channel, I divide the sample into different portfolios based on the country (or region) where each firm is based and then compare the CARs for each portfolio. This is a very imprecise test of the wake-up call channel, because any number of country-specific effects could cause fluctuations in aggregate market indices. If country-specific or region-specific effects do not exist, however, this suggests that the wake-up call effect was not an important transmission mechanism during these crises.

Figures XIII through XV show a sample of these tests and graph the CARs for Austral-Asia, Europe, and Latin America. The difference across the crisis periods is striking. During the first phase of the Asian crisis, there was little difference in the performance of these three regions. During the second phase of the Asian crisis, the differences across regions widened significantly. Austral-Asia had average returns about 5 percent lower than Europe and Latin America had average returns about 8 percent lower than Austral-Asia. During the Russian crisis, average

[28] The sensitivity analysis uses other measures of stock liquidity. Results do not change significantly.
[29] One caveat, however, is that if this wake-up call effect is driven largely by institutional investors, it would be difficult to differentiate a wake-up call effect from the forced-portfolio recomposition discussed above.

abnormal returns for Austral-Asia were slightly positive, while they were close to -7 percent for Europe and -14 percent for Latin America. These graphs are far from a definitive test of the "wake-up call" effect, since firms in a given region could share other characteristics (in addition to geographic location) which make them more or less vulnerable to a crisis. For example, Austral-Asian firms could have a greater percent of sales in the Asian crisis region and therefore any "regional" effect might largely be an income effect. The graphs do suggest, however, that regional and country characteristics (whether a common geographical location or something else) were important during these crises.

To summarize, the graphical results presented in this section provide mixed support for the five transmission mechanisms during the Asian and Russian crises. There is some support for a product-competitiveness effect during the second stage of the Asian crisis and the Russian crisis, and strong support for an income effect during the same two periods. There is no evidence of a credit crunch during any of the three crisis periods, and only weak support for a portfolio-recomposition effect during the second phase of the Asian crisis. There are strong country and regional effects during all three crisis periods (although these effects are smaller during the first phase of the Asian crisis.) These could be caused by some sort of wake-up call or country reevaluation, or they could reflect other geography-specific characteristics or events.

## V. Multivariate Regression Analysis

Although this graphical analysis is suggestive, it is difficult to draw strong conclusions from this type of univariate approach. As eluded to in the discussion of the country-specific effects, if two (or more) firm characteristics are highly correlated, then it is difficult to isolate the impact of a specific characteristic on stock returns. For example, larger firms are more likely to have direct sales exposure to a given crisis region, and larger firms may be less vulnerable to global crises (if investors switch to larger, more stable companies after a shock). In this case, a

portfolio of firms with direct exposure to a crisis region may outperform firms with no exposure to the region, although this difference in performance has no direct relationship to the variable under consideration (exposure to the region.) In other words, an international shock could simultaneously have several different effects on a firm and it is difficult to identify the strength of these effects by focusing on only one variable.

Moreover, there are a number of econometric problems with the simple model estimated in equations 1 through 3, so statistical tests based on this model are invalid. This section addresses both of these issues and utilizes a methodology developed by Sefcik and Thompson [1986] to estimate the strength of the different transmission mechanisms during the Asian and Russian crises. The first part of this section discusses the estimation methodology and the second part reports a central set of multivariate regression results. The final part of this section focuses on one key result--the large and highly significant country-specific effects--and tests if several macroeconomic and corporate governance variables can explain these effects.

## V.A Methodology

The standard methodology for estimating the effect of different firm characteristics on stock market returns during an event is to regress the abnormal returns or cumulative abnormal returns (calculated in equations 1-3) on the firm characteristics of interest. For example, if $\hat{\boldsymbol{\varepsilon}}_\tau$ is the (*N x 1)* vector of average abnormal returns (for the sample of *N* stocks) during the portion of the crisis period $\tau$ , and ***F*** is an (*N x K*) matrix of firm characteristics (with the first column a vector of ones), the standard technique is to estimate the cross-section relationship:

$$\hat{\boldsymbol{\varepsilon}}_\tau = \mathbf{F}\boldsymbol{\theta} + \mathbf{v}_\tau \tag{4}$$

where $\boldsymbol{\theta}$ is the (*K x 1*) vector of coefficients and $\mathbf{v}_\tau$ is an (*N x 1*) vector of disturbances.

Under several mild regularity conditions, this three-step approach is equivalent to the two-step methodology described in Sefcik and Thompson [1986]. Sefcik and Thompson rewrite the basic model of equations 1-4 as:

(5) $R_{it} = \alpha_i + \beta_i R_{mt} + \gamma_i \delta_t + \mu_{it}$

(6) $\hat{\gamma}_i = \mathbf{F}_i \mathbf{\Psi} + \eta_i$

(7) $E(\mu_{it}) = 0 \qquad var(\mu_{it}) = \sigma^2_{\mu_i}$

(8) $E(\eta_i) = 0 \qquad var(\eta_i) = \sigma^2_{\eta_i}$

(9) $i = 1,2....N$

(10) $t = 1,2....P, P+1....P+C$

In this model, $t$ is now defined as an index for the entire period (both the pre-crisis period $P$ and the crisis period $C$); $\delta_t$ is a dummy variable equal to 1 during the event period (i.e. the crisis) and 0 otherwise; $\hat{\gamma}_i$ is a parameter estimated in equation *5*; $\mathbf{F}_i$ is the (*1 x K)* row vector of firm *i*'s characteristics; $\mathbf{\Psi}$ is a (*K x 1*) parameter vector corresponding to the $K$ firm characteristics; and all other variables are defined as above. The first step of this estimation strategy is to estimate equation *5*. In the second step, the estimated $\hat{\gamma}_i$ is used to calculate equation *6*. When the crisis period ($C$) is equivalent to the $\tau$ in equation *4*, then the vector created by stacking the $\hat{\gamma}_i$'s for all $N$ firms in equation *6* corresponds to the $\hat{\boldsymbol{\varepsilon}}_\tau$ in equation *4*, and the $\mathbf{\Psi}$ estimated in equation *6* corresponds to the $\boldsymbol{\theta}$ in equation *4*.

OLS estimates obtained using either of these methodologies are only consistent and efficient, however, if the disturbances are i.i.d. in the cross-section. The data set described in Section III violates this assumption for two reasons. First, the disturbances are not homoscedastic across firms. For two firms $i$ and $j$ during any time period $t$, either:

$E(\varepsilon'_{it}\varepsilon_{it}) \neq E(\varepsilon'_{jt}\varepsilon_{jt})$ for all $i$ and $j$ in equation *1*; or

$E(\mu'_{it}\mu_{it}) \neq E(\mu'_{jt}\mu_{jt})$ for all $i$ and $j$ in equation *5*

As a result, standard errors will be biased and coefficient estimates will be inefficient. It is straightforward to adjust for this problem by using any heteroscedastic-consistent estimation technique.

Second, and more problematic, is the fact that disturbances are not independent across firms. For two firms *i* and *j* during any time period *t*, either:

$$E(\varepsilon'_{it}\varepsilon_{jt}) \neq 0 \quad \text{for all } i \text{ and } j \text{ in equation } 1; \text{ or}$$

$$E(\mu'_{it}\mu_{jt}) \neq 0 \quad \text{for all } i \text{ and } j \text{ in equation } 5$$

This problem occurs because all firms in the sample are affected by the crisis at the same time, (as opposed to most event studies where the "event", such as a stock split, occurs for different firms on different dates.) The resulting cross-correlation in disturbances across firms causes standard errors to be biased and inconsistent. One technique for adjusting for this problem is to use a GLS estimator that utilizes the covariance matrix of returns for firms in the pre-crisis period. This technique is not feasible, however, for a large number of firms, and generally requires that the number of time periods is greater than the number of firms (i.e. that $T>N$.)[30] This requirement is clearly not satisfied in the data set described in Section III.

An alternative solution is utilized by Sefcik and Thompson [1986] and builds on the model of equations 4-6. Basically, Sefcik and Thompson propose dividing the sample of firms into different portfolios and then using these portfolios to estimate the impact of firm characteristics on returns during a specific event. By dividing the sample into a smaller dimension (*K* portfolios instead of *N* companies), it is possible to simultaneously correct for heteroscedasticity and the cross-correlation in returns. Coefficient estimates and standard errors are unbiased and consistent.[31] Appendix B describes this procedure in more detail. The remainder

[30] For an example and proof of these claims, see Collins and Dent [1984].
[31] GLS coefficient estimates are efficient, but as discussed above, these are not feasible for this sample.

of this paper focuses on Sefcik and Thompson's estimation technique, but for comparison, will also report estimates obtained using the traditional procedures that yield biased standard errors.

There is one final issue to consider before estimating the impact of firm characteristics on vulnerability to the Asian and Russian crises. As discussed in Section III, the Worldscope data contains a number of extreme outliers. Many are undoubtedly reporting errors, but it is difficult to judge which outliers are mistakes and which represent unusual corporate practices (such as the extremely high debt/equity ratios of several Asian firms.) Therefore, instead of trying to evaluate which outliers should be dropped, I estimate the relevant model for each specification and then drop extreme outliers (defined as having standard errors greater than three times the standard deviation from the sample mean.) After dropping these outliers, I repeat the estimation of the relevant model.[32]

## V.B Central Results

The model which forms the base specification for this paper is written in equations *5* through *10.* The technique used to estimate this model is described in Section V.A, and definitions for the pre-crisis and crisis periods are discussed in Section IV.A. For consistency with the graphical analysis, the matrix of explanatory variables (***F***) includes the same firm characteristics and variable definitions as discussed in Section IV.B. More specifically, the explanatory variables are meant to test for each of the five propagation mechanisms*:* product competitiveness, an income effect, a credit crunch, a forced-portfolio recomposition, and a wake-up call effect. [33]

[32] Results do not change significantly if I use other tests for outliers, such as Cook's distance statistic or simply plotting residuals and removing observations which visually appear to be extreme outliers.
[33] More specifically, product competitiveness is measured by a dummy variable equal to one if the firm produces in the same four-digit SIC group as a "major export" from the crisis zone as defined in Table III. An income effect is measured by a dummy variable equal to one if the firm has over 5 percent of sales, assets, or net income in the crisis zone. A credit crunch is measured by the ratio of net short-term debt to equity. The forced-portfolio recomposition is tested by a liquidity variable which I dummy variable equal to one if stock returns are nonzero in at least 3/4 of the trading days in the one-year, pre-crisis period.

Table IV presents the base estimates for the two phases of the Asian crisis and the Russian crisis. Countries from the crisis zone continue to be excluded from the relevant analysis. Columns (1), (3) and (5) present OLS estimates obtained via the standard estimation technique, which yields biased standard errors. Columns (2), (4) and (6) report estimates with unbiased and consistent coefficient estimates and standard errors, obtained using Sefcik and Thompson's methodology. In each case, extreme outliers are removed (between 5 and 30 firms, depending on the specification.) Many of the coefficient estimates and standard errors do change significantly across methodologies, suggesting that the bias resulting from the cross-correlation in returns is important. As a result, in the discussion that follows, I focus on the unbiased estimates reported in the even-numbered columns.

Most of the results reported in Table IV support the preliminary graphical evidence reported above. During the first phase of the Asian crisis none of the four central coefficients are significant (and half do not even have the predicted signs). During the second phase of the Asian crisis, the *product competitiveness*, *income effect*, and *portfolio recomposition* coefficients are all highly significant (at the 1 percent level) and the *credit crunch* coefficient is insignificant. Moreover, these estimates suggest that the magnitude of these effects could be large. For example, the *product competitiveness* coefficient indicates that firms which produced in the same industries as the "major exports" from the crisis economies had average daily returns 13 percent lower than firms which did not produce in these sectors (over the entire twelve-week crisis period.) The *income effect* coefficient suggests that companies with sales, income or assets in the Asian-crisis region experienced average daily returns 25 percent lower than firms with no exposure to the region. Finally, the *portfolio-recomposition* coefficient indicates that more liquid stocks had average daily returns 7 percent lower than less liquid stocks.

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Finally, the wake-up call effect is proxied by the country-dummy variables, with Germany as the excluded country. For more information on any of these definitions, see Section IV and/or Appendix A.

The magnitude of these coefficients is even greater during the Russian crisis. During this period, the coefficients on *product competitiveness* and *income effect* are both highly significant. More specifically, the *product competitiveness* coefficient indicates that firms which produced in the same industries as "major exports" from Russia had average daily returns 32 percent lower than firms which did not produce in these industries (over the entire two-week crisis period.) The *income effect* coefficient suggests that companies with sales, income or assets in Russia experienced average daily returns 101% lower than firms with no exposure to Russia. It is worth noting that this does not mean that the average return for a company with exposure to Russia was -101%. Instead, this estimate indicates that the average stock return of a company with exposure to Russia was, on average, 101% lower than for a company which did not have exposure to Russia.[34] Finally, the *credit crunch* and *portfolio recomposition* coefficients are not significant during the Russian crisis.

Coefficient estimates for the country dummy variables included in these regressions are reported in Table V.[35] For each phase of the Asian crisis and the Russian crisis, several coefficients are individually significant (with Germany as the omitted country) and an F-test indicates that the coefficients are jointly, highly significant. Many of the coefficient values are large (reaching -3.01 for Venezuela during the Russian crisis), which implies that during these periods, geographic location may have a larger impact on stock returns than any other firm characteristics. Most of the estimates are intuitive. For example, during both phases of the Asian crisis, the coefficient for Japan is negative and significant. During the Russian crisis, the former-communist countries have large and significant negative coefficients. One interesting pattern is that most of the Latin American coefficients are insignificant during the Asian crisis, while almost all are negative and highly significant during the Russian crisis. This suggests that there

[34] In the entire sample of firms, the average daily return during the two-week Russian crisis was -0.8%. The average daily return for the group of firms with exposure to Russia (defined as over 5% of their sales, income, or assets in Russia) was -2.0% over the same period.

could have been some sort of regional reevaluation of Latin America during the Russian crisis, but not during the Asian crisis.

One key result which emerges from this series of regressions is that the importance of each transmission mechanism (including the pattern of the country-specific effects) varies across each phase of the Asian crisis and the Russian crisis. This is not surprising. The importance of each propagation mechanism should be highly dependent on the specific characteristics of the country (or countries) where the crisis originates and, in particular, on how that country is related to the rest of the world. For example, the product-competitiveness effect was large and significant during the second stage of the Asian crisis and the Russian crisis, and insignificant during the first stage of the Asian crisis. This is not surprising because the "major exports" from the lower-income Asian countries listed in Table III constituted a smaller share of total global exports than during either of the other crisis periods.[36] Similarly, the portfolio-recomposition effect was significant during the second phase of the Asian crisis, but insignificant during the first phase of the Asian crisis and the Russian crisis. This is not surprising because the total value of foreign portfolio investment in the crisis zone for the second phase of the Asian crisis was significantly greater than in either of the other crisis zones. Since this paper only includes the Asian and Russian crises, it is difficult to perform any meaningful cross-section regression analysis linking crisis-country characteristics with how the crisis is transmitted internationally. These issues merit further research, but at the very least, this paper's results suggest that how a crisis is transmitted is closely related to characteristics of the country (or region) where the crisis originates.

To summarize the results of this section, regression estimates suggest that product-competitiveness and income effects were both important transmission mechanisms during the

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[35] I only report coefficient estimates based on columns (2), (4) and (6) of Table IV because the OLS coefficient estimates and standard errors are biased and inconsistent.

[36] Although Russia the list of "major exports" for Russia is short, Russia does export a large share of global exports for the few goods listed in Table III. For example, Russia exports nearly 50 percent of total global exports of natural gas (gaseous) in 1997 and nearly 30 percent of global exports of unwrought nickel and nickel alloy.

second phase of the Asian crisis and the Russian crisis. A credit crunch does not appear to be an important propagation mechanism during either crisis period. Although it is difficult to test for the importance of a forced-portfolio recomposition or wake-up call effect, some very rough tests suggest that these channels could also have been important. During the second phase of the Asian crisis, more liquid stocks had significantly lower returns than the rest of the sample. During each crisis period, country and regional effects were significant and could have a larger impact than all of the other propagation mechanisms combined. A final result from this series of tests is that the relative strength of the various transmission mechanisms varies across crisis periods.

## V.C A Closer Look at the Country-Specific Effects

One of the key results from this regression analysis is that the country-specific effects are consistently significant during each crisis period, even after controlling for a variety of firm-specific variables. Moreover, the coefficient estimates for these country-specific effects reported in Table V suggest that these effects can be large in magnitude. Where a firm was located during the Asian and Russian crises could have a greater impact on stock returns than all of the other propagation mechanisms combined. For example, after controlling for product competitiveness, an income effects, etc., a firm located in Argentina had average daily abnormal returns 203 percent lower than firms located in Germany (the excluded country) during the entire two-week Russian crisis.

A number of factors could cause these large country-specific effects. Unique domestic events which are unrelated to the Asian or Russian crisis, such as election results or new economic information, could affect the aggregate stock market index of a country. For example, the large negative coefficient for Venezuela during the Russian crisis may be driven more by concerns about Chavez than events in Russia. On the other hand, these large country-specific effects could reflect some sort of country reevaluation or wake-up call that is prompted by the Asian and/or Russian crisis. As discussed in Section II.A., a crisis in one country (or investor

behavior in one country) could provide information about other countries (or how investors will behave in other countries.) For example, the Asian crisis could have forced investors to reassess the risk in emerging markets in general and therefore sell stocks in all low- and middle-income countries. Wake-up calls could include any sort of herding or behavior resulting from informational asymmetries, as well as any new information on macroeconomic or corporate governance variables.

Given the wide range of factors which could drive the large country-specific effects, it is extremely difficult to assess the relative importance of each of these factors. Moreover, since this paper focuses on how recent financial crises have affected individual *companies*, instead of individual *countries*, a thorough investigation of this topic is beyond the scope of this paper. Nonetheless, since the country-specific effects are so large, this section provides a preliminary analysis of which types of variables might drive these large country-specific effects. More specifically, it focuses on two groups of variables: macroeconomic statistics and corporate governance indicators.

An extensive literature has analyzed which macroeconomic and/or corporate governance variables might affect a country's vulnerability to a crisis.[37] I focus on several variables which are most frequently cited in the literature and which are available for most of the countries used throughout this paper. More specifically, several macroeconomic variables which could indicate that a country is more vulnerable to a crisis are: a current account deficit, a government budget deficit, a low level of international reserves, a recent lending boom, and a lower level of per capita income. Several corporate governance variables which could indicate that a country is

[37] Recent work analyzing the role of macroeconomic variables in the transmission of financial crises includes: Eichengreen, Rose, and Wyplosz [1996], Sachs, Tornell and Velasco [1996], Glick and Rose [1999], Kaminsky and Reinhart [1999], and Tornell [1999]. Recent work analyzing the role of corporate governance in the transmission of financial crises includes: Caballero and Krishnamurthy [1999] and Claessens, Djankov and Klapper [2000]. Boone, Breach, Friedman and Johnson [2000] is the only empirical paper to analyze the role of both macroeconomic and corporate governance variables. See this body of literature for further information on why any of these variables might affect a country's vulnerability to a crisis. Also see La Porta, Lopez-de-Silanes, Shleifer, and Vishny [1998] for further information on the corporate governance variables used in this section.

more vulnerable to a crisis are: weaker shareholder rights, a higher prevalence of corruption, a higher risk that assets will be expropriated, a less effective judicial system, and a weaker rule of law. Specific definitions for these variables and data sources are listed in Appendix C.

To test for the importance of each of these variables, I regress the country-specific effects reported in Table V on this series of ten macroeconomic and corporate governance variables. Results for each of the three crisis periods are reported in Table VI.[38] During the first phase of the Asian crisis, none of the variables is individually significant. An F-test for the joint significance of the macroeconomic variables or of the corporate finance variables (reported at the bottom of the table) also suggests that neither group of variables explains a significant portion of the country-specific effects. Intuitively, this means that after controlling for certain characteristics of firms located within each country (i.e. after controlling for any product-competitiveness, income, credit crunch, or portfolio-composition effects), this group of macroeconomic or corporate finance variables does not explain a significant portion of country's stock market performance during the first phase of the Asian crisis.

During the second phase of the Asian crisis, several of the coefficient estimates are individually significant, although all of the signs are not intuitive. The negative coefficients on *government budget balance* and *rule of law* indicate that countries with a greater fiscal surplus and better rule of law tended to have lower country-specific effects. The other significant coefficient estimates, however, are more intuitive. The negative coefficient on *international reserve ratio* suggests that countries with a higher ratio of M2 to reserves tended to have a lower country-specific effect. Countries with a higher per capita income and less risk of expropriation had significantly greater country specific effects. Moreover, tests for joint significance suggest that the group of macroeconomic variables and of corporate governance variables are each highly significant.

Coefficient estimates from the Russian crisis yield another set of results. The coefficient on the constant term is large, negative, and highly significant, suggesting that on average, all countries in the world experienced substantial negative stock returns during this period. The only macroeconomic variable which is even borderline significant is the coefficient on *lending boom*, with the positive sign suggesting that countries which experienced a lending boom had higher country-specific effects during this period. The only corporate governance variable which is even borderline significant is the coefficient on *judicial efficiency*, with the positive sign indicating that countries with more efficient judiciary systems had higher country-specific effects during this period. Tests for the joint significance of the macroeconomic and corporate governance variables suggest that neither group of variables is significant.

These tests of which macroeconomic and/or corporate governance variables explain the large country-specific effects can obviously be extended in a number of directions. Adding a variety of other variables standard in these two branches of literature tends to yield the same pattern of mixed signs and significance, and none of the variables (except per capita income during the second phase of the Asian crisis) is consistently significant.[39]

Although preliminary, this series of results has several implications. First, macroeconomic and corporate governance variables are poor predictors of a country's stock market performance (after controlling for the firm effects) during the early phase of the Asian crisis and the Russian crisis. Second, macroeconomic and corporate governance variables were more successful predictors of country stock market performance during the later half of the Asian

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[38] I do not pool the sample across crisis periods because different macroeconomic and corporate governance variables could play different roles during each period, based on the characteristics of the country where the crisis originated.

[39] For example, I have added a number of additional macroeconomic variables such as: banking system strength; growth in the money supply; growth in GDP per capita; the ratio of total debt to GDP; the ratio of short-term debt to total debt; inflation; openness; and a measure of exchange rate overvaluation. I have also added a number of additional corporate governance variables such as: accounting standards; the risk of contract repudiation; creditor rights; and corruption perceptions. All of the macroeconomic variables are from World Bank [2000] and all of the corporate governance variables (except the last) are from La Porta, Lopez-de-Silanes, Shleifer, and Vishny [1998]. The corruption perceptions index is published by

crisis. One of the strongest and most robust predictors is a country's level of per capita income; wealthier countries performed significantly better during this period. Third, when the insignificance of most of the explanatory variables during most of the crisis periods is combined with the large and consistently significant country-specific effects found during each crisis, this suggests that country-specific events had a large impact on stock market movements. Global events did not overshadow the importance of local events during these periods. Fourth and finally, Section V. B. (and the sensitivity analysis below) finds strong evidence that the later part of the Asian crisis and the Russian crisis were transmitted (at least partially) through firms via channels such as a product-competitiveness and income effects. This section finds that after controlling for these firm-specific effects, most macroeconomic and corporate governance variables are not significant. Therefore, crises may be transmitted internationally more through micro/firm-level channels than through macro/country-level channels.

## VI. Sensitivity Tests and Model Extensions

The estimates reported above are based on a number of strong assumptions and simplifications. Therefore, this section will perform a number of sensitivity tests. More specifically, it will test for the impact of: reclassifying period definitions; redefining key variables; and modifying the base model specification. Due to space constraints, I do not show the univariate graphs or report all of the multivariate regression results. Any results which differ significantly from the base estimates reported above, however, are discussed in detail.[40]

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Transparency International [2000]. I have also added regional dummy variables and tested for the impact of dropping each of the variables in the base specification.

[40] Full results are available from the author.

## VI.A Sensitivity Tests I: Reclassifying Period Definitions

As a first set of sensitivity tests, I reclassify the period definitions used in the base analysis. This series of tests is useful for several reasons. First, there is no clear end date for the Asian or Russian crisis, and it is possible that either of these periods ended on dates different than the periods specified above. Second, different propagation channels should be stronger over different time periods. For example, the portfolio-recomposition effect, since it is driven by liquidity constraints, would only have a short-term impact on stock returns, while a product-competitiveness effect would continue to have an impact over the longer term. Third, there is evidence that markets tend to under-react to individual news and over-react to a long series of related news.[41] Therefore, the short time periods used to analyze these crises (and especially the Russian crisis) might not capture the longer-term, market-equilibrium impact of these events. Fourth and finally, even though the time periods utilized in the base analysis are longer than for a typical event study, they still might not be long enough to incorporate all of the relevant information which impacts stock returns. For example, during the Russian crisis it was unclear if the payment system of the country would collapse, if there would be a change in trade regulations, or if the country would erupt into violence. Until these issues were resolved, the full impact of any product-competitiveness or income effects may not have been reflected in stock returns.

To test if any of these factors affect the central results reported in Section V, I modify the period definitions used for the base analysis. For each crisis, I estimate the same model and use the same start date, but define the crisis period as lasting one week, two weeks, one month, two months, three months and six months. Results are reported in Table VII and in each case the base case from Section V is highlighted. For the first phase of the Asian crisis, none of the coefficients (except the country dummy variables) are significant for any of the time periods. This is even true

[41] For an excellent survey of this empirical literature and a model explaining this pattern of investor behavior, see Barberis, Shleifer and Vishny [1998].

over the longest time period (24 weeks), which includes the second phase of the Asian crisis. This suggests that most of the impact of the second phase of the Asian crisis is driven by the higher-income Asian economies which are not included in the first phase of the crisis.

For the second phase of the Asian crisis, none of the coefficients (except the country dummy variables) are significant when the crisis is defined as lasting one or two weeks. This is not surprising given that the main "crisis events" for the high-income Asian economies occurred after this period. After two weeks, however, the *product competitiveness* coefficient becomes significant, and after eight weeks the *portfolio recomposition* coefficient becomes significant. Over the longest time horizon (24 weeks), the product-competitiveness and income effects remain significant, although the portfolio-recomposition effect becomes insignificant. This result supports the previous point that the impact of different propagation channels varies across different time horizons, and in particular, that the portfolio-recomposition effect, since it is driven by liquidity constraints, is a shorter-term propagation channel.

Results for the final period, the Russian crisis, also fluctuate based on the time period under consideration. The income effect is significant when the crisis period is defined as lasting eight weeks or less. The product-competitiveness effect is only significant when the crisis is defined as lasting two weeks or longer than twelve weeks (and the coefficient even becomes positive over the four and eight-week crisis periods.) This could indicate that several weeks into the Russian crisis, investors believed that domestic turmoil (such as problems with the payments mechanism and crime) would disrupt Russian production, counteracting any competitive advantage from the devaluation of the ruble. Over the longer time horizon, when Russian production did not collapse, the usual competitiveness effect became significant. Similarly, when the Russian economy did not collapse, the earnings loss from operating in Russia may have been less than predicted, and the income effect became insignificant. As a whole, however, it is difficult to draw any strong conclusions from the longer crisis periods because the collapse of Long-Term Capital Management occurred about one month after the defined start of the Russian

crisis. Any unusual stock market movements after this date may not directly result from the Russian crisis.

As a final sensitivity test for the impact of varying period definitions, I modify the start date for each crisis. I start each crisis one and two weeks earlier than defined above. Coefficient estimates do not change significantly.

## VI.B Sensitivity Tests II: Redefining Key Variables

As a next series of sensitivity tests, I examine the impact of redefining each of the variables used in the base analysis. The first variable, *product competitiveness*, was measured by a dummy variable equal to one if a firm produced in the same industry as a "major export" from the crisis zone. Major export was defined as any four-digit SITC group for which exports by countries in the crisis zone were at least twenty percent of total world exports. As a sensitivity test, I use sample information (instead of world export information) to define "major industries" for the crisis zone. More specifically, I now define major industry as any two-digit SIC group for which sales by firms in the crisis zone were at least 5 percent of global sales (and non-traded sectors were excluded). This classification procedure is even more imprecise than that used above, since it is based on two-digit instead of four-digit industry codes and it is harder to identify goods which are not actively exported and traded.

Table VIII shows the new list of major industries resulting from this classification procedure. The list is much broader than the initial list of major exports in Table III and therefore provides a useful complement to the previous analysis. Next, I use this new definition of major industries to create a product-competitiveness dummy variable equal to one if a company produces in the same two-digit SIC group as a major industry in the crisis zone. Then I repeat the base regression analysis using this new measure of product competitiveness. Despite the substantial changes in this variable, coefficient estimates are remarkably stable for both phases of the Asian crisis. The *product competitiveness* coefficient remains insignificant for the first phase

of the Asian crisis and is negative and highly significant for the second phase of the Asian crisis. During the Russian crisis, however, the *product competitiveness* coefficient becomes insignificant. This is not surprising as Russia's only major industry, according to this new variable, is the broad category "metal mining." Column 2 of Table IX shows the results for the second phase of the Asian crisis and of Table X shows the results for the Russian crisis.[42]

The second variable in the base specification, *income effect*, is a dummy variable equal to one if a company has over five percent of sales, assets, or income in the crisis region. I try changing this definition by using ten or twenty percent as the cutoff for an income effect. The number of companies with direct exposure to the crisis zone falls substantially, but the coefficient remains large and significant during the second phase of the Asian crisis and the Russian crisis, and insignificant during the first phase of the Asian crisis.

The third variable in the base specification, *credit crunch*, is measured by the ratio of net short-term debt to equity. There are a number of other ratios which could also capture a firm's dependence on short-term financing and its vulnerability to a credit crunch. Therefore, I try eight different definitions of this variable: net short-term debt to working capital; net short-term debt to total assets; net short-term debt to total capital; coverage ratio; current ratio; quick ratio; share of short-term debt to total debt, and the ratio of working capital to assets. Each of these variables is defined in detail in Appendix A. When I re-estimate the base regression using each of these definitions, the *credit crunch* coefficient is never significant for the first phase of the Asian crisis or the Russian crisis, and the coefficient often has an unexpected sign. During the second phase of the Asian crisis, most of the *credit crunch* coefficients continue to be insignificant, and their signs fluctuate. Column 3 of Tables IX and X show this result when *credit crunch* is measured by the coverage ratio. In every case, redefining the *credit crunch* variable has no significant impact on any of the other central coefficient estimates.

[42] I do not report results for the Asian crisis-Phase 1 because these results were weaker in the base analysis and do not become significant during these sensitivity tests.

The fourth variable in the base regression, *portfolio recomposition*, is measured by a dummy variable equal to one if the stock had non-zero returns in at least 75 percent of the pre-crisis trading days. I redefine share liquidity as the percent of shares traded to shares outstanding. Since this measure is not available for a majority of firms, the sample size shrinks significantly (and the sample of countries shrinks to five members of the OECD.) Despite these changes, most coefficient estimates do not change significantly. Moreover, the *portfolio recomposition* coefficient remains highly significant during the second phase of the Asian crisis and becomes highly significant during the Russian crisis. These estimates support the finding reported above: more liquid stocks may be more vulnerable to crises elsewhere in the world.

Finally, the last set of variables included in the base regression are the country dummy variables which are designed to capture any sort of wake-up call effect or country-specific events. Since any reevaluation or wake-up call could take place along regional as well country-specific borders, I replace the country dummy variables with regional dummy variables (using the regions defined in Table I.) The regional dummy variables are jointly significant (even when I continue to include the country dummies), and the other coefficient estimates do not change significantly.

## VI. C Sensitivity Tests III: Modifying the Base Model Specification

As a final series of sensitivity tests, I estimate a number of modifications to the base model. I begin by estimating a constant-mean-return model instead of a market model. More specifically, I no longer control for the market index in equation 5 and instead estimate:

$$R_{it} = \alpha_i + \gamma_i \delta_t + \mu_{it} \tag{11}$$

Variable definitions, model assumptions, and the estimation technique remain unchanged. Coefficient estimates are virtually identical to those based on the market-return model. Column 4

of Tables IX and X show these results for the second phase of the Asian crisis and the Russian crisis, respectively.

Next I add a number of additional explanatory variables to the base specification. First, as mentioned above, company size could interact with the propagation of shocks. (For example, if small firms have more difficulty raising capital, they may be more vulnerable to a credit crunch.) To control for the impact of firm size, I add several variables to the base regression: total market capitalization; total equity; total assets; total sales; or net income (all expressed in US$). Market capitalization, equity and net income are usually positive and significant, and the other two variables are usually positive and insignificant. None of the other coefficient estimates, however, change significantly. Column 5 of Tables IX and X report estimates when market capitalization is included as a control for firm size. This set of tests suggests that larger companies may be less vulnerable to crises elsewhere in the world.

Next, several analyses of the Asian crisis have focused on the importance of over-borrowing and crony capitalism in causing this crisis and/or making firms in this region more vulnerable to an initial shock. Although this paper does not address the initial cause of either crisis, these concerns may have led to a reevaluation of firms which were highly-leveraged and/or had unusually low levels of profitability. To test for this effect, I add a number of controls for total leverage, profitability and company valuation: total debt to equity; net long-term debt to equity; total debt to total capital; total debt to assets; return on equity; return on assets; return on invested capital; or book to market value. Most of these coefficients are insignificant for each crisis period. The leverage ratios are never negative and significant (as expected if more leveraged companies were more vulnerable to these crises) and the coefficient on *book to market* is also never significant. The coefficient on *return on assets* and *return on invested capital*, however, is positive and significant during the second phase of the Asian crisis and the Russian crisis. Columns 6 through 8 of Tables IX and X report a sample of these results. This sample of

results shows the key outcome of this series of tests: adding any of these additional controls has no significant impact on the other coefficient estimates.

As a final modification to the base model, I include a set of dummy variables for the industry groups specified in Table II. The dummy variables are jointly significant for each crisis period, but most coefficient estimates do not change significantly. Column 9 of Tables IX and X shows the only minor changes that do occur. During the second phase of the Asian crisis the coefficient on the income effect is no longer significant at the 1 percent level, and during the Russian crisis the coefficient on product competitiveness is no longer significant at the 1 percent level (although both of these coefficients remain significant at the 5 percent level.) It is worth noting, however, that for both of these crises, the coefficient on product competitiveness remains negative and significant at the 5 percent level, despite the fact that the industry dummy variables capture some of this competitiveness effect.

## VII. Caveats and Conclusions

This paper began by reinterpreting previous theoretical work as describing five mechanisms by which a country-specific shock could be transmitted to firms around the world. These five transmission mechanisms are: product competitiveness; an income effect; a credit crunch; a forced-portfolio recomposition; and a wake-up call. After briefly reviewing the macroeconomic empirical work testing these various channels, the paper described a new firm-level data set of financial statistics, industry information, geographic data, and stock returns for over 10,000 companies in 46 countries.

The remainder of the paper used this firm-level data and an event-study methodology to test if firm vulnerability to the Asian and Russian crises was affected by factors such as: industry; international exposure; debt quantity and structure; trading liquidity; and/or geographic location. Results suggest that a product-competitiveness effect was an important transmission mechanism

during the later part of the Asian crisis and the Russian crisis. For example, if a firm produced in the same industry as a major export from East Asia or Russia, its average daily abnormal stock returns were 13 percent lower (than firms which did not compete in these sectors) during the later part of the Asian crisis, or 32 percent lower during the Russian crisis. Results also suggest that an income effect was an important transmission mechanism during the same two periods. For example, if a firm had direct exposure to East Asia or Russia (as measured by a significant share of sales, income or assets in the crisis region), its average daily abnormal stock return was 25 percent lower during the later part of the Asian crisis, or 101 percent lower during the Russian crisis (relative to the returns for firms which did not have direct exposure to the crisis region.)

A credit crunch does not appear to be an important propagation mechanism during either crisis period. Moreover, during the later part of the Asian crisis, more liquid stocks had significantly lower returns than the rest of the sample. This could result from the crisis being transmitted to other firms through some sort of forced-portfolio recomposition. Country-specific effects, which could reflect some sort of wake-up call, country revaluation, or any country-specific events, can have a larger impact than all of the other mechanisms combined. During the later phase of the Asian crisis, countries with a higher per capita income level had significantly greater country-specific effects. For each of the other crisis periods, however, macroeconomic and corporate governance variables were unable to explain a significant share of these country-specific effects (after controlling for the firm-level characteristics).

An extensive set of robustness tests examines the impact of: reclassifying period definitions; redefining key variables; and modifying the basic model specification. Results are highly robust, although the strength of several propagation mechanisms is highly dependent on the defined length of the crisis period. One finding which emerges from this series of tests is that the relative importance of the various transmission mechanisms varies across crises. This is not surprising because how a crisis is propagated internationally should depend on the characteristics

of the country (or region) where the crisis originates. As a result, it is unlikely that a single model can capture how shocks are propagated during all crises.

These results, however, are only a first step. Several statistics are imprecisely measured (such as product competitiveness and the income effect.) Other variables are only rough proxies for the propagation mechanism being tested (such as using trading liquidity to capture the impact of a forced-portfolio recomposition.) Reporting errors in the Worldscope database could still affect results. The country-specific effects are largely unexplained, even after controlling for a variety of macroeconomic and corporate governance variables. Moreover, the paper does not address the equally important question of what causes the initial crisis. Therefore, this paper's results should be interpreted as a useful (and hopefully edifying) complement to the macroeconomic, empirical evidence on how shocks are propagated internationally.

# Appendix A: Variable Definitions[1]

| | |
|---|---|
| Book to Market | Ratio of book value per share to market price. Calculated at company's fiscal year end. |
| Common Equity | Common shareholder's investment in a company. Includes common stock value, retained earnings, capital surplus, capital stock premium, cumulative gain or loss of foreign currency translations, discretionary reserves, and negative goodwill. |
| Coverage Ratio* | The ratio of earnings before interest and taxes to interest expense on debt. |
| Common Shares Traded to Common Shares Outstanding* | Common shares outstanding are the number of shares outstanding at the company's year end and is the difference between issued shares and treasury shares. For companies with more than one type of common/ordinary shares, common shares outstanding represents the combined shares adjusted to reflect the par value of the share type. Common shares traded is the number of shares of the company traded during the year. |
| Current Assets | Cash and other assets that are reasonably expected to be realized in cash, sold or consumer within one year or one operating cycle. |
| Current Liabilities | Debt or other obligations that the company expects to satisfy within one year. |
| Current Ratio | The percent of current assets to current liabilities. |
| Days Return is Non-Zero* | Dummy variable equal to one if the stock return is not equal to zero in at least three-quarters of the non-weekend days in the pre-crisis period. |
| Market Capitalization | Product of shares outstanding and market price at fiscal year end. For companies >1 type of common/ordinary shares, market capitalization represents company's total market value. |
| Net Income | Income after all operating and non-operating income, expenses, reserves, income taxes, minority interest, and extraordinary items. Represents income before preferred dividends. |
| Net Long-Term Debt* | Any interest bearing financial obligations (excluding amounts due within one year and net of premium or discount) minus cash and cash equivalents. |
| Net Sales | Gross sales and other operating revenue less discounts, returns and allowances. For financial companies, sales represents total operating revenue. |
| Net Short-Term Debt* | Any debt payable within one-year (including the current portion of long-term debt and sinking fund requirements of preferred stock or debentures) minus cash and cash equivalents. |
| Percent Assets by Region* | Ratio of assets in a given region to total assets. |
| Percent Operating Income by Region* | Ratio of operating income in a given region to total operating income, where operating income is the difference between sales and total operating expenses. |
| Percent Sales by Region* | Ratio of sales in a region to net sales. |
| Quick Ratio | The ratio of (cash and equivalents + net receivables) to current liabilities. |
| Return on Assets | 100* (Net income before preferred dividends + ((interest expense on debt - interest capitalized) * (1 - Tax Rate))) / Last year's total assets. Calculated differently for financial companies. |
| Return on Equity | 100* (Net income before preferred dividends - preferred dividend requirements) / Last year's common equity |
| Return on Invested Capital | 100*Net income before preferred dividends + ((Interest expense on debt - interest capitalized) * (1 - Tax Rate))) / (Last year's total capital + last year's short-term debt & current portion of long-term debt) |
| Share of Short-term Debt in Total Debt* | The ratio of net short-term debt to total debt. |
| Total Assets | For industrials: the sum of total current assets, long-term receivables, investment in unconsolidated subsidiaries, other investments, net property plant and equipment and other assets. For banks: the sum of cash and due from banks, total investments, net loans, customer liability on acceptances, investment in unconsolidated subsidiaries, real estate assets, net property, plant and equipment and other assets. For insurance companies: sum of cash, total investments, premium balance receivables, investments in unconsolidated subsidiaries, net property, plant, and equipment and other assets. |
| Total Capital | The total investment in the company. The sum of common equity, preferred stock, minority interest, long-term debt, non-equity reserves and deferred tax liability in untaxed reserves. |
| Working Capital | The difference between current assets and current liabilities. |

**NOTE:** (1) Variables are either taken directly from the Worldscope database or calculated based on information provided by Worldscope and/or price information from Datastream. Statistics marked with a * are not directly available from Worldscope and are calculated as stated. For more information on specific statistics, see Worldscope database.

## Appendix B: Sefcik and Thompson's Estimation Methodology

The estimation strategy utilized in Sefcik and Thompson [1986] can be summarized in five steps:

1) Use OLS to estimate equation *5* for the full sample of *N* firms over the entire time period of length *T* (including both the pre-crisis and crisis periods.) Obtain the parameter values: $\hat{\boldsymbol{\alpha}}, \hat{\boldsymbol{\beta}}$ and $\hat{\boldsymbol{\gamma}}$ which are each (*N x 1)* vectors of $\alpha_i$'s, $\beta_i$'s and $\gamma_i$'s, respectively.

2) Rewrite equation *6* in vector form:

$$\hat{\boldsymbol{\gamma}} = \mathbf{F}\,\boldsymbol{\Psi} + \mathbf{E}$$

with: $\hat{\boldsymbol{\gamma}} = \begin{bmatrix} \hat{\gamma}_1 \\ . \\ . \\ . \\ \hat{\gamma}_N \end{bmatrix}$ , $\mathbf{F} = \begin{bmatrix} f_{11} & . & . & . & f_{K1} \\ . & . & & & . \\ . & & . & & . \\ . & & & . & . \\ f_{1N} & . & . & . & f_{KN} \end{bmatrix}$ and $\mathbf{E} = \begin{bmatrix} \varepsilon_1 \\ . \\ . \\ . \\ \varepsilon_N \end{bmatrix}$

*K* continues to be the number of firm characteristics of interest.

Then use the $\hat{\boldsymbol{\gamma}}$ estimated in step 1 and OLS to estimate:

$$\begin{aligned} \hat{\boldsymbol{\Psi}} &= (\mathbf{F}'\mathbf{F})^{-1}\mathbf{F}'\hat{\boldsymbol{\gamma}} \\ &= \mathbf{X}\hat{\boldsymbol{\gamma}} \end{aligned}$$

where $\mathbf{X}$ is a (*K x N)* matrix for which each row can be interpreted as an estimated weight of the impact of the firm characteristic *k*.

3) Use the weights implied in $\mathbf{X}$ to form *K* portfolios from the original *N* firms. The crisis should impact each portfolio only through the one characteristic shared by each portfolio. In other words: $\mathbf{XF} = \mathbf{I}$ where $\mathbf{I}$ is a (*K x K)* identity matrix. Each portfolio (i.e. each row in $\mathbf{X}$) has a zero net value for each characteristic in $\mathbf{X}$, except the one characteristic *k* (which is the row number.) Use these weights to calculate returns for each portfolio:

$$\hat{\mathbf{R}}_K = \mathbf{X}\mathbf{R}_N$$

with: $\hat{\mathbf{R}}_K = \begin{bmatrix} \hat{R}_{11} & . & . & . & \hat{R}_{1T} \\ . & . & & & . \\ . & & . & & . \\ . & & & . & . \\ \hat{R}_{K1} & . & . & . & \hat{R}_{KT} \end{bmatrix}$ and $\mathbf{R}_N = \begin{bmatrix} R_{11} & . & . & . & R_{1T} \\ . & . & & & . \\ . & & . & & . \\ . & & & . & . \\ R_{N1} & . & . & . & R_{NT} \end{bmatrix}$

# Appendix B (continued)

4) Insert the estimated returns $\hat{\mathbf{R}}_K$ into equation *5* to calculate parameter values $\hat{\boldsymbol{\alpha}}, \hat{\boldsymbol{\beta}}$ and $\hat{\boldsymbol{\gamma}}$ which are each (*K x 1)* vectors of $\alpha_k$'s , $\beta_k$'s and $\gamma_k$'s. The parameters estimated in $\hat{\boldsymbol{\gamma}}$ provide unbiased and consistent estimates of the impact of the *K* firm characteristics on abnormal returns.

5) Use the disturbances from this estimation of equation *5* to calculate the variance-covariance matrix:

$$\boldsymbol{\Omega} = \frac{1}{T-3}\left[\hat{\boldsymbol{\mu}}\,\hat{\boldsymbol{\mu}}'\right] \qquad \text{where} \qquad \hat{\boldsymbol{\mu}} = \begin{bmatrix} \hat{\mu}_{11} & . & . & . & \hat{\mu}_{1T} \\ . & . & & & . \\ . & & . & & . \\ . & & & . & . \\ \hat{\mu}_{K1} & . & . & . & \hat{\mu}_{KT} \end{bmatrix}$$

This estimate of $\boldsymbol{\Omega}$ is unbiased and consistent. It does not require that the disturbance terms of equation *5* are i.i.d. Sefcik and Thompson show how $\boldsymbol{\Omega}$ is related to the biased covariance estimates obtained through the two-step or three-step estimation techniques which do not account for the cross-correlation in disturbances across firms.

# Appendix C:
# Macroeconomic and Corporate Governance Variable Definitions

| Variable | Definition | Source |
|---|---|---|
| ***Macroeconomic Variables*** | | |
| Current account balance | The current account balance as a percent of GDP. A negative number is a current account deficit. Measured in 1996 for the Asian crisis and 1997 for the Russian crisis. | World Bank [2000] |
| Government budget balance | Overall budget balance (including grants) as a percent of GDP. A negative number is a fiscal deficit. Measured in 1996 for the Asian crisis and 1997 for the Russian crisis. | World Bank [2000] |
| International Reserve Level | Ratio of money and quasi money (M2) to gross international reserves. Measured in 1996 for the Asian crisis and 1997 for the Russian crisis. | World Bank [2000] |
| Lending Boom | Credit to the private sector as a share of GDP. Measured in 1996 for the Asian crisis and 1997 for the Russian crisis. | World Bank [2000] |
| Per Capita Income | GDP per capita, adjusted for PPP, in thousands of current international dollars. Measured in 1996 for the Asian crisis and 1997 for the Russian crisis. | World Bank [2000] |
| ***Corporate Governance Variables***[a] | | |
| Anti-Director Rights | An index aggregating the shareholder rights labeled as "antidirector rights." The index is formed by adding 1 when (1) the country allows shareholders to mail their proxy vote to the firm, (2) shareholders are not required to deposit their shares prior to the general shareholders' meeting, (3) cumulative voting or proportional representation of minorities in the board of directors is allowed, (4) an oppressed minorities mechanism is in place, (5) the minimum percentage of share capital that entitles a shareholder to call for an extraordinary shareholders' meeting is less than or equal to 10 percent, or (6) shareholders have preemptive rights that can be waived only by a shareholders' vote. Index ranges from 0 to 6. | La Porta, Lopez-de-Silanes, Shleifer, and Vishny [1998] |
| Corruption | ICR's assessment of the corruption in government. Lower scores indicate that 'high government officials are likely to demand special payments" and "illegal payments are generally expected throughout lower levels of government" in the form of "bribes connected with import and export licenses, exchange controls, tax assessment, policy protection, or loans." Average of the months of April and October of the monthly index between 1982 and 1995. Scale from zero to 10, with lower scores for higher levels of corruption. | La Porta, Lopez-de-Silanes, Shleifer, and Vishny [1998] |
| Expropriation Risk | ICR's assessment of the risk of "outright confiscation" or "forced nationalization." Average of the months of April and October of the monthly index between 1982 and 1995. Scale from zero to 10, with lower scores for higher risks. | La Porta, Lopez-de-Silanes, Shleifer, and Vishny [1998] |
| Judicial Efficiency | Assessment of the "efficiency and integrity of the legal environment as it affects business, particularly foreign firms" produced by the country risk rating agency Business International Corp. It "may be taken to represent investors' assessments of conditions in the country in question." Average between 1980 and 1983. Scale from 0 to 10; with lower scores, lower efficiency levels. | La Porta, Lopez-de-Silanes, Shleifer, and Vishny [1998] |
| Rule of Law | Assessment of the law and order tradition in the country produced by the country risk rating agency International Country Risk (ICR). Average of the months of April and October of the monthly index between 1982 and 1995. Scale from 0 to 10, with lower scores for less tradition for law and order. | La Porta, Lopez-de-Silanes, Shleifer, and Vishny [1998] |

**NOTE:** (a) Variable definitions taken directly from La Porta, Lopez-de-Silanes, Shleifer, and Vishny [1998].

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# Table I: Number of Companies by Country and Region

| | Asian Crisis | Russian Crisis |
|---|---|---|
| **Asia** | **3,855** | **3,146** |
| China | 68 | 18 |
| Hong Kong | 326 | 251 |
| India | 187 | 161 |
| Indonesia | 68 | 46 |
| Japan | 1,919 | 1,782 |
| Korea | 256 | 224 |
| Malaysia | 413 | 295 |
| Pakistan | 13 | 5 |
| Philippines | 77 | 65 |
| Singapore | 152 | 128 |
| Taiwan | 204 | 64 |
| Thailand | 172 | 107 |
| **Austral-Asia** | **223** | **180** |
| Australia | 182 | 140 |
| New Zealand | 41 | 40 |
| **Europe** | **2,634** | **2,570** |
| Austria | 49 | 52 |
| Belgium | 89 | 79 |
| Czech Republic | 50 | 44 |
| Denmark | 97 | 91 |
| Finland | 57 | 56 |
| France | 413 | 388 |
| Germany | 319 | 306 |
| Greece | 100 | 65 |
| Hungary | 20 | 19 |
| Ireland | 16 | 20 |
| Italy | 126 | 142 |
| Luxembourg | 10 | 8 |
| Netherlands | 147 | 140 |
| Norway | 82 | 70 |
| Poland | 46 | 20 |
| Portugal | 46 | 45 |
| Spain | 110 | 106 |
| Sweden | 152 | 142 |
| Switzerland | 114 | 125 |
| U.K. | 591 | 652 |
| **Latin America** | **195** | **169** |
| Argentina | 29 | 26 |
| Brazil | 55 | 47 |
| Chile | 35 | 25 |
| Colombia | 3 | 5 |
| Mexico | 51 | 49 |
| Peru | 11 | 8 |
| Venezuela | 11 | 9 |
| **North America** | **4,321** | **3,993** |
| Canada | 445 | 402 |
| U.S. | 3,876 | 3,591 |
| **Other** | **194** | **177** |
| Israel | 20 | 19 |
| South Africa | 113 | 104 |
| Turkey | 61 | 54 |
| **Total Sample** | **11,422** | **10,235** |

# Table II: Sample Statistics

| | Asian Crisis[a] | Russian Crisis[a] |
|---|---|---|
| **Median Firm Market Capitalization (in $000)** | | |
| Asia | $272,548 | $163,461 |
| Austral-Asia | 424,321 | 351,749 |
| Europe | 336,723 | 367,382 |
| Latin America | 548,898 | 709,553 |
| North America | 393,925 | 487,771 |
| Other | 417,728 | 438,469 |
| ***Whole Sample*** | ***$333,515*** | ***$337,783*** |
| **Median Firm Net Income (in $000)** | | |
| Asia | $9,554 | $5,685 |
| Austral-Asia | 22,046 | 19,860 |
| Europe | 16,519 | 17,817 |
| Latin America | 34,055 | 42,662 |
| North America | 15,067 | 17,559 |
| Other | 29,004 | 27,590 |
| ***Whole Sample*** | ***$13,607*** | ***$13,127*** |
| **Percent of Firms by Industry[b]** | | |
| Petroleum | 2.5% | 2.6% |
| Finance/Real Estate | 18.4 | 18.5 |
| Consumer Durables | 15.5 | 15.6 |
| Basic Industry | 12.8 | 12.4 |
| Food/Tobacco | 5.7 | 5.8 |
| Construction | 6.5 | 6.4 |
| Capital Goods | 10.3 | 10.4 |
| Transportation | 3.2 | 3.2 |
| Utilities | 5.4 | 5.5 |
| Textiles/Trade | 7.5 | 7.3 |
| Services | 8.0 | 8.2 |
| Leisure | 4.1 | 4.1 |
| Public Administration | 0.1 | 0.1 |
| ***Total Number of Firms*** | ***11,422*** | ***10,235*** |
| ***Firms Excluded as Not-Actively Traded*** | ***2,732*** | ***2,335*** |

**NOTES:**
(a) Data from the annual report in the one year preceding the relevant crisis. Asian crisis is defined as starting on 6/25/97. Russian crisis is defined as starting on 8/17/98.
(b) Based on the firm's primary SIC code. Industry definitions are based on two-digit SIC groups defined in Campbell [1996]. The only changes are: the addition of a group for Public administration, and the addition of several two-digit codes (which were not included anywhere by Campbell) to pre-specified groups. More specifically, SIC codes for each group are: Petroleum (13, 29); Finance/real Estate (60-69); Consumer durables (25, 30, 36-37, 39, 50, 55, 57); Basic industry (8, 10, 12, 14, 24, 26, 28, 33); Food/tobacco (1, 2, 7, 9 20, 21, 54); Construction (15-17, 32, 52); Capital goods (34, 35, 38); Transportation (40-42, 44, 45, 47); Utilities (46, 48, 49); Textiles/trade (22, 23, 31, 51, 53, 56, 59); Services (72, 73, 75, 76, 80-82, 87, 89); Leisure (27, 58, 70, 78, 79, 83-86, 88), Public administration (43, 91-97)

# Table III: Major Exports from the Crisis Zone[a]

| Asian Crisis: Phase 1 & 2 | | | Asian Crisis: Phase 2 only | | | Russian Crisis | | |
|---|---|---|---|---|---|---|---|---|
| **SITC** | **Product** | **SIC** | **SITC** | **Product** | **SIC** | **SITC** | **Product** | **SIC** |
| 0361 | Crustaceans, frozen | 913 | 0371 | Fish, prepared, preserved, nes | 2091,2092 | 3432 | Natural gas, gaseous | 1311 |
| 0372 | Crustaceans, mollusks, prepared | 2091, 2092 | 0471 | Other cereal flours | 2041 | 6727 | Semi-fin. iron, etc.25%+c | 3316 |
| 0423 | Rice, milled, semi-milled | 112, 2044 | 0731 | Cocoa powder, sweetened | 2066 | 6831 | Nickel, nickel alloy, unwrought | 3339 |
| 0548 | Vegetable products, roots, tubers | 139 | 0751 | Pepper, dry, crushed, ground | 2099 | 7187 | Nuclear reactors, parts nes | 3621 |
| 0721 | Cocoa beans | 179 | 2313 | Other natural gums | 831 | | | |
| 2231 | Copra | 2079 | 2450 | Fuel wood, wood charcoal | 831 | | | |
| 2311 | Natural rubber latex | 831 | 2923 | Vegetable material, for plaiting | NA | | | |
| 2312 | Natural rubber exc.latex | 831 | 5792 | Waste, styrene polymers | 2821 | | | |
| 2475 | Wood, non-conif. ,rough | 831 | 6113 | Whole bovine skin leather | 3111 | | | |
| 2484 | Wood, non-conif, sawn | 2435 | 6118 | Leather, special finish | 3111 | | | |
| 2485 | Wood, non-conif. worked, shaped | 2435 | 6132 | Heads, tails, paws etc. | 279 | | | |
| 2655 | Abaca, Manila hemp, waste | 179 | 6531 | Fabric, synthetic filament yarn | 2221 | | | |
| 2657 | Coconut fiber and waste | 179 | 6532 | Fabric, 85%+syn.stpl.fiber | 2221 | | | |
| 2831 | Copper ores, concentrates | 1021 | 6533 | Fabric<85% syn.stpl fiber+ctn | 2221 | | | |
| 2841 | Nickel ores, concentrates | 1099 | 6551 | Pile fabric, knit, crochet | 2259 | | | |
| 2862 | Thorium ores, concentrates | 1099 | 6552 | Other knit crochet fabrics | 2259 | | | |
| 3431 | Natural gas, liquefied | 1321 | 6562 | Labels, badge etc ex embroidered | 2396 | | | |
| 4222 | Palm oil, fractions | 2076 | 6565 | Embroidery | 2396 | | | |
| 4223 | Coconut oil, fractions | 2076 | 6673 | Precious, semiprecious stones | 5094 | | | |
| 4224 | Palm kernel oil, fractions | 2076 | 6944 | Nails, tacks, etc. aluminum | 3363 | | | |
| 4312 | Fat, oil, any veg. partly processed | 2076 | 7161 | Electric motors<=37.5w | 3621 | | | |
| 4313 | Fatty acid etc. from wax | 2079 | 7468 | Other ball, roller bearing | 3562 | | | |
| 6129 | Other leather articles, nes | 3199 | 7512 | Calculating, accounting machines | 3578 | | | |
| 6343 | Plywood, solely of wood | 2436, 2435 | 7526 | Input or output units | 3575 | | | |
| 6344 | Other plywood, veneered panels | 2435, 2436 | 7527 | Storage units, data processing | 3572 | | | |
| 6354 | Wood, domestic use ex. furniture | NA | 7529 | Data processing equipment, nes | 3577 | | | |
| 6871 | Tin, tin alloys, unwrought | 3321 | 7599 | Parts, data processors etc. | 3679 | | | |
| 7131 | Aircraft piston engines | 3724 | 7611 | Color television receiver | 3651 | | | |
| 7622 | Portable radio receivers | 3663 | 7638 | Sound, video recording etc | 3651 | | | |
| 7628 | Other radio receivers | 3669 | 7722 | Printed circuits | 3672 | | | |
| 7633 | Turntables, record player | 3651 | 7761 | TV picture tubes, CRT, etc | 3671 | | | |
| 8437 | Shirts, mens boys, knit | 2321 | 7762 | Other electronic valves, tubes | 3679 | | | |
| 8482 | Plastic, rubber, apparel, etc | 2385 | 7763 | Diodes, transistors etc. | 3674 | | | |
| 8512 | Sports footwear | 3131 | 7764 | Electronic microcircuits | 3674 | | | |
| | | | 7768 | Electronic comp parts, crystals | 3679 | | | |
| | | | 7863 | Transport containers | 3799 | | | |
| | | | 7917 | Rail, tram. coach, etc | 3743 | | | |
| | | | 7932 | Ships, boats, other vessels | 3731, 3732 | | | |
| | | | 7937 | Tugs and pusher craft | 3731, 3732 | | | |
| | | | 8447 | Blouses, shirt-blouses, etc | 2331, 2361 | | | |
| | | | 8451 | Babies' garments, clothes | 2361, 2369 | | | |
| | | | 8469 | Made-up clothing. Accessories | 2381, 2384 | | | |
| | | | 8811 | Cameras, flash equipment | 3861 | | | |
| | | | 8831 | Cine film,35mm+,developed | 2671 | | | |
| | | | 8859 | Time measuring equipment | 3873 | | | |
| | | | 8972 | Imitation jewelry | 3961 | | | |

**NOTES:** (a) Major exports defined as four-digit SITC groups for which total exports from countries in the crisis zone are 20 percent or more of total world exports. Export statistics taken from the full year prior to the defined start of the crisis.
(b) Asian crisis-Phase 1 countries defined as: Indonesia, Malaysia, Philippines, and Thailand.
(c) Asian crisis-Phase 2 countries defined as: Hong Kong, Indonesia, Korea, Malaysia, Philippines, Singapore, Taiwan, and Thailand.

# Table IV
# Regression Results[a]

| | Asian Crisis - Phase 1 | | Asian Crisis - Phase 2 | | Russian Crisis | |
|---|---|---|---|---|---|---|
| | Standard[b] (1) | S-T[b] (2) | Standard[b] (3) | S-T[b] (4) | Standard[b] (5) | S-T[b] (6) |
| **Constant** | 0.025** | -0.002 | -0.216** | -0.085 | -0.830** | -0.618** |
| | (0.003) | (0.046) | (0.006) | (0.064) | (0.021) | (0.191) |
| **Product Competitiveness[c]** | 0.027 | 0.013 | -0.382** | -0.134** | -1.235** | -0.321** |
| | (0.019) | (0.029) | (0.024) | (0.032) | (0.172) | (0.112) |
| **Income Effect[d]** | 0.017 | 0.012 | -0.461** | -0.254** | -2.008** | -1.011** |
| | (0.037) | (0.042) | (0.099) | (0.094) | (0.579) | (0.277) |
| **Credit Crunch[e]** | -0.006** | -0.004 | -0.003 | 0.000 | -0.304 | 0.007 |
| | (0.002) | (0.004) | (0.004) | (0.005) | (0.240) | (0.184) |
| **Portfolio Recomposition[f]** | 0.024** | -0.002 | -0.240** | -0.068** | -0.857** | -0.094 |
| | (0.003) | (0.016) | (0.008) | (0.019) | (0.023) | (0.087) |
| **Country Dummies[g]** | Yes** | Yes** | Yes** | Yes** | Yes** | Yes** |
| ***# Observations*** | ***8035*** | ***8035*** | ***7177*** | ***7177*** | ***7682*** | ***7682*** |
| ***Crisis Days*** | ***60*** | ***60*** | ***60*** | ***60*** | ***10*** | ***10*** |
| ***Total Days*** | ***321*** | ***321*** | ***321*** | ***321*** | ***270*** | ***270*** |

**NOTES:**

(a) Standard errors in parentheses. * is significant at the 5 percent level; ** is significant at the 1 percent level.

(b) Standard is the traditional OLS estimates which do not adjust for the cross-correlation in returns or heteroscedasticity. S-T is Sefcik and Thompson's [1986] methodology.

(c) Dummy variable equal to 1 if firm's main product is in the same four-digit SIC group as a "major export" from the crisis zone. (See Table III for "major exports".)

(d) Dummy variable equal to 1 if firm has over 5 percent of sales, assets or net income in the crisis zone.

(e) Ratio of net short-term debt to common equity.

(f) Dummy variable equal to 1 if stock had non-zero returns in at least 3/4 of the trading days in the one year prior to the crisis.

(g) Country dummy variables included in regression and reported in Table V. Stars indicate the joint significance of dummy variables. Germany is the excluded country.

# Table V: Country-Specific Effects[a]

| | | Asian Crisis-Phase 1 | | Asian Crisis-Phase 2 | | Russian Crisis | |
|---|---|---|---|---|---|---|---|
| | | Coefficient | St. Error | Coefficient | St. Error | Coefficient | St. Error |
| ***Asia*** | China | 0.003 | (0.256) | -0.190 | (0.238) | 0.183 | (0.560) |
| | Hong Kong | 0.125 | (0.137) | --- | --- | -0.115 | (0.725) |
| | India | -0.071 | (0.154) | -0.096 | (0.155) | 0.589 | (0.503) |
| | Indonesia | --- | --- | --- | --- | -1.886 | (1.046) |
| | Japan | -0.267** | (0.101) | -0.348** | (0.125) | 0.092 | (0.431) |
| | Korea | -0.068 | (0.160) | --- | --- | 0.621 | (0.869) |
| | Malaysia | --- | --- | --- | --- | 1.095 | (0.977) |
| | Pakistan | 0.091 | (0.187) | -0.099 | (0.179) | 0.704 | (0.816) |
| | Philippines | --- | --- | --- | --- | 0.025 | (0.593) |
| | Singapore | -0.119 | (0.096) | --- | --- | -0.140 | (0.565) |
| | Taiwan | -0.027 | (0.125) | --- | --- | 0.068 | (0.423) |
| | Thailand | --- | --- | --- | --- | -0.038 | (0.762) |
| ***Austral-*** | Australia | -0.027 | (0.066) | -0.074 | (0.081) | 0.436 | (0.238) |
| ***Asia*** | New Zealand | 0.113 | (0.070) | -0.143 | (0.099) | 0.524 | (0.282) |
| ***Europe*** | Austria | 0.056 | (0.049) | 0.030 | (0.049) | -0.050 | (0.164) |
| | Belgium | 0.030 | (0.044) | 0.132** | (0.050) | 0.304* | (0.151) |
| | Czech Republic | 0.081 | (0.088) | -0.004 | (0.103) | -0.866** | (0.284) |
| | Denmark | 0.015 | (0.049) | 0.034 | (0.048) | 0.255* | (0.127) |
| | Finland | 0.058 | (0.066) | 0.034 | (0.066) | -0.423* | (0.174) |
| | France | 0.037 | (0.043) | 0.033 | (0.045) | 0.183 | (0.133) |
| | Germany | --- | --- | --- | --- | --- | --- |
| | Greece | -0.006 | (0.132) | 0.049 | (0.171) | -0.500 | (0.532) |
| | Hungary | 0.333* | (0.135) | -0.028 | (0.214) | -2.066** | (0.628) |
| | Ireland | 0.127 | (0.066) | 0.161* | (0.074) | -0.597* | (0.250) |
| | Italy | 0.193* | (0.077) | 0.145 | (0.081) | -0.183 | (0.281) |
| | Luxembourg | 0.071 | (0.140) | 0.143 | (0.126) | 0.505 | (0.389) |
| | Nether. | 0.044 | (0.059) | -0.017 | (0.060) | 0.152 | (0.134) |
| | Norway | 0.169* | (0.071) | 0.021 | (0.079) | -0.718** | (0.221) |
| | Poland | 0.176 | (0.164) | -0.219 | (0.169) | -1.180* | (0.469) |
| | Portugal | 0.128 | (0.068) | 0.021 | (0.064) | -0.130 | (0.239) |
| | Spain | 0.078 | (0.069) | 0.085 | (0.074) | -0.298 | (0.222) |
| | Sweden | 0.126* | (0.064) | -0.035 | (0.065) | -0.157 | (0.159) |
| | Switzerland | 0.052 | (0.044) | 0.046 | (0.042) | -0.476** | (0.131) |
| | UK | 0.093 | (0.049) | 0.037 | (0.046) | -0.239 | (0.144) |
| ***Latin*** | Argentina | -0.013 | (0.136) | -0.122 | (0.181) | -2.027** | (0.509) |
| ***America*** | Brazil | -0.013 | (0.124) | -0.500** | (0.154) | -1.327** | (0.511) |
| | Chile | -0.003 | (0.089) | -0.167 | (0.099) | -1.092** | (0.303) |
| | Colombia | 0.309* | (0.153) | 0.071 | (0.167) | -1.042 | (0.666) |
| | Mexico | 0.180 | (0.112) | 0.011 | (0.148) | -0.999* | (0.461) |
| | Peru | -0.164 | (0.141) | -0.022 | (0.141) | -1.443** | (0.368) |
| | Venezuela | 0.177 | (0.176) | -0.217 | (0.166) | -3.009** | (0.832) |
| ***North*** | Canada | 0.116* | (0.055) | -0.020 | (0.081) | -0.351 | (0.245) |
| ***America*** | US | 0.182** | (0.066) | 0.022 | (0.088) | -0.355 | (0.266) |
| ***Other*** | Israel | -0.036 | (0.269) | 0.063 | (0.270) | -0.150 | (0.348) |
| | South Africa | -0.005 | (0.071) | -0.274** | (0.092) | -1.093** | (0.286) |
| | Turkey | 0.516* | (0.240) | 0.319 | (0.260) | -1.402* | (0.634) |

**NOTES:** (a) Results based on regressions estimated with Sefcik-Thomspon methodology . See Table IV for variable definitions and regression specification. * is significant at the 5 percent level; ** is significant at the 1 percent level.

# Table VI
# Regression Results: Explaining the Country-Specific Effects[a]

| | Asian Crisis: Phase 1 | Asian Crisis: Phase 2 | Russian Crisis |
|---|---|---|---|
| Constant | -0.050 | -0.266* | -3.769** |
| | (0.258) | (0.150) | (1.753) |
| ***Macroeconomic Variables*** | | | |
| Current Account Balance | 0.003 | -0.003 | -0.029 |
| | (0.005) | (0.004) | (0.036) |
| Government Budget Balance | -0.009 | -0.011* | -0.065 |
| | (0.009) | (0.006) | (0.058) |
| International Reserve Ratio | -0.001 | -0.004* | -0.001 |
| | (0.003) | (0.002) | (0.021) |
| Lending Boom | -0.001 | -0.001 | 0.009* |
| | (0.001) | (0.001) | (0.004) |
| Per Capita Income | -0.002 | 0.014*** | -0.015 |
| | (0.010) | (0.004) | (0.056) |
| ***Corporate Governance Variables*** | | | |
| Anti-Director Rights | 0.002 | -0.013 | 0.080 |
| | (0.018) | (0.015) | (0.146) |
| Corruption | 0.001 | -0.011 | -0.198 |
| | (0.023) | (0.015) | (0.147) |
| Expropriation Risk | 0.048 | 0.091*** | 0.282 |
| | (0.050) | (0.026) | (0.350) |
| Judicial Efficiency | -0.033 | -0.028 | 0.230* |
| | (0.029) | (0.019) | (0.140) |
| Rule of Law | 0.003 | -0.043*** | -0.012 |
| | (0.029) | (0.012) | (0.175) |
| $R^2$ | 0.28 | 0.65 | 0.40 |
| ***Macroeconomic Variables: F-statistic***[b] | 0.76 | 5.03*** | 1.24 |
| ***Corporate Governance Variables: F-statistic***[b] | 0.64 | 4.37*** | 2.09 |
| ***Observations*** | 31 | 29 | 33 |

**NOTES:**

(a) Dependent variables are the country-specific effects reported in Table V and obtained from the regressions reported in Table IV. Variable definitions and sources are listed in Appendix C. Standard errors are in parentheses and are White-adjusted for heteroscedasticity. * is significant at the 10 percent level; ** is significant at the 5 percent level; and *** is significant at the 1percent level.

(b) Statistic from a test of the null hypothesis that the group of macroeconomic or corporate governance variables are jointly zero.

# Table VII
# Sensitivity Tests: Varying Crisis Period Length[a]

| | Product Competitiveness | Income Effect | Credit Crunch | Portfolio Recomposition | Country Effects[b] |
|---|---|---|---|---|---|
| ***Asian Crisis - Phase 1[c]*** | | | | | |
| **1 week** | -0.0107<br>(0.0996) | -0.1352<br>(0.1481) | 0.0001<br>(0.0154) | -0.0132<br>(0.0611) | Yes |
| **2 weeks** | -0.0912<br>(0.0722) | -0.1504<br>(0.1115) | -0.0020<br>(0.0108) | 0.0189<br>(0.0421) | Yes |
| **4 weeks** | 0.0250<br>(0.0506) | -0.0612<br>(0.0782) | -0.0098<br>(0.0076) | 0.0249<br>(0.0293) | Yes |
| **8 weeks** | 0.0237<br>(0.0358) | -0.0338<br>(0.0518) | -0.0029<br>(0.0054) | 0.0061<br>(0.0200) | Yes |
| **12 weeks** | 0.0130<br>(0.0286) | 0.0122<br>(0.0421) | -0.0044<br>(0.0043) | -0.0024<br>(0.0160) | Yes |
| **24 weeks** | -0.0332<br>(0.0207) | -0.0505<br>(0.0337) | -0.0029<br>(0.0035) | -0.0183<br>(0.0123) | Yes |
| ***Asian Crisis - Phase 2[d]*** | | | | | |
| **1 week** | -0.0460<br>(0.1113) | -0.0124<br>(0.2991) | 0.4045<br>(0.3897) | 0.0704<br>(0.0632) | Yes |
| **2 weeks** | -0.0166<br>(0.0789) | 0.0264<br>(0.2155) | 0.0046<br>(0.0107) | -0.0001<br>(0.0418) | Yes |
| **4 weeks** | -0.1279*<br>(0.0556) | -0.2778<br>(0.1582) | 0.0138<br>(0.0077) | -0.0351<br>(0.0315) | Yes |
| **8 weeks** | -0.0936*<br>(0.0387) | -0.1613<br>(0.1137) | 0.0053<br>(0.0055) | -0.0469*<br>(0.0221) | Yes |
| **12 weeks** | -0.1338**<br>(0.0321) | -0.2542**<br>(0.0939) | 0.0003<br>(0.0051) | -0.0679**<br>(0.0193) | Yes |
| **24 weeks** | -0.0769**<br>(0.0227) | -0.1790**<br>(0.0672) | 0.0034<br>(0.0036) | 0.0037<br>(0.0142) | Yes |
| ***Russian Crisis[e]*** | | | | | |
| **1 week** | -0.0313<br>(0.1551) | -1.0347**<br>(0.3607) | 0.1078<br>(0.2292) | 0.0038<br>(0.1191) | Yes |
| **2 weeks** | -0.3214**<br>(0.1120) | -1.0111**<br>(0.2769) | 0.0072<br>(0.1841) | -0.0942<br>(0.0867) | Yes |
| **4 weeks** | 0.0162<br>(0.0775) | -0.6590**<br>(0.1988) | -0.2033<br>(0.1317) | -0.0586<br>(0.0627) | Yes |
| **8 weeks** | 0.0580<br>(0.0552) | -0.4043**<br>(0.1447) | -0.1215<br>(0.0807) | -0.0230<br>(0.0440) | Yes |
| **12 weeks** | -0.0355<br>(0.0461) | -0.1296<br>(0.1244) | -0.0938<br>(0.0762) | 0.0422<br>(0.0356) | Yes |
| **24 weeks** | -0.1339**<br>(0.0419) | -0.0440<br>(0.1092) | -0.0400<br>(0.0662) | 0.0202<br>(0.0318) | Yes |

**NOTES:** (a) Standard errors in parentheses. * is significant at the 5 percent level; ** is significant at the 1 percent level. Base regressions from Section V for each crisis are shaded.
(b) "Yes" indicates that I am unable to reject an F-test of the joint significance of the country dummy variables.
(c) The first phase of the Asian crisis is defined as beginning on June 25, 1997. Crisis countries are: Indonesia, Malaysia, Philippines, and Thailand.
(d) The second phase of the Asian crisis is defined as beginning on October 1, 1997. Crisis countries are: Hong Kong, Indonesia, Korea, Malaysia, Philippines, Singapore, Taiwan, and Thailand.
(e) The Russian crisis is defined as beginning on August 17, 1998. The only crisis country is Russia.

# Table VIII
# Major Industries in the Crisis Zone[a]
## (Two-digit SIC Codes in parentheses)

| Asian Crisis-Phase 1[b] | Asian Crisis-Phase 2[c] | Russian Crisis |
|---|---|---|
| (8)Forestry | (8)Forestry | (10) Metal Mining |
| (32) Stone, clay, and glass products | (16) Heavy Construction, ex. building | |
| | (22)Textile Mill Products | |
| | (23) Apparel and other Textile Products | |
| | (31) Leather and leather products | |
| | (32) Stone, clay, and glass products | |
| | (33) Primary metal industries | |
| | (36) Electronic & other electric equipment | |
| | (44) Water Transportation | |
| | (45) Transportation by Air | |
| | (50)Wholesale trade-durable goods | |
| | (55)Automotive dealers & service stations | |
| | (56) Apparel and accessory stores | |

**NOTES:**

(a) (a)"Major industries" defined as two-digit SIC groups for which net sales from companies based in the crisis zone are 5 percent or more of net sales for the entire sample. Sales are measured in US$ and are taken from annual reports in the one year prior to the defined start of the crisis. Industries which are non-traded and are not directly competitive across countries are excluded. More specifically, the excluded industries are: utilities; services; leisure; finance/real estate; and public administration. SIC codes for the excluded industries are defined in Table II.

(b) Asian crisis-Phase 1 countries defined as: Indonesia, Malaysia, Philippines, and Thailand.

(c) Asian crisis-Phase 2 countries defined as: Hong Kong, Indonesia, Korea, Malaysia, Philippines, Singapore, Taiwan, and Thailand.

# Table IX
# Sensitivity Tests: Asian Crisis-Phase 2[a]

| | Base Results (1) | Redefine Product Compet.[b] (2) | Redefine Credit Crunch[c] (3) | Constant-Mean Return[d] (4) | Add control for Firm Size[e] (5) | Add control for Leverage[f] (6) | Add control for Profitability[g] (7) | Add control for Valuation[h] (8) | Add Industry Dummies[i] (9) |
|---|---|---|---|---|---|---|---|---|---|
| **Constant** | -0.085 | -0.063 | -0.099 | -0.085 | -0.087 | -0.073 | -0.091 | -0.085 | -0.003 |
| | (0.064) | (0.064) | (0.063) | (0.067) | (0.065) | (0.064) | (0.064) | (0.065) | (0.277) |
| **Product Competitiveness** | -0.134** | -0.120** | -0.129** | -0.134** | -0.131** | -0.134** | -0.134** | -0.133** | -0.089** |
| | (0.032) | (0.016) | (0.032) | (0.034) | (0.032) | (0.032) | (0.032) | (0.032) | (0.029) |
| **Income Effect** | -0.254** | -0.271** | -0.261** | -0.254** | -0.264** | -0.250** | -0.258** | -0.254** | -0.229* |
| | (0.094) | (0.096) | (0.083) | (0.095) | (0.094) | (0.094) | (0.095) | (0.094) | (0.094) |
| **Credit Crunch** | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.001 | 0.000 | 0.000 | -0.001 |
| | (0.005) | (0.005) | (0.000) | (0.005) | (0.005) | (0.005) | (0.005) | (0.005) | (0.005) |
| **Portfolio Recomposition** | -0.068** | -0.071** | -0.071** | -0.068* | -0.076** | -0.069** | -0.071** | -0.068** | -0.063** |
| | (0.019) | (0.019) | (0.020) | (0.034) | (0.020) | (0.020) | (0.020) | (0.019) | (0.019) |
| **Country Dummies** | Yes** | Yes** | Yes** | Yes** | Yes** | Yes** | Yes** | Yes** | Yes** |
| ***# Observations*** | 7177 | 7179 | 7537 | 7177 | 7178 | 7157 | 6998 | 7140 | 7184 |
| ***Crisis Days*** | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 |
| ***Total Days*** | 321 | 321 | 321 | 321 | 321 | 321 | 321 | 321 | 321 |

**NOTES:**

(a) Standard errors in parentheses. Asian crisis firms excluded from the regression. All variables defined in Table IV except as noted.
* is significant at the 5 percent level; ** is significant at the 1 percent level

(b) Product competitiveness is redefined using sample statistics and two-digit SIC codes. See Table VIII for details.

(c) Credit crunch is defined by the coverage ratio.

(d) Specification is a constant-mean-return model (equation 11) instead of a market model.

(e) Firm size measured by total market capitalization (in US$).

(f) Leverage is measured by the ratio of total debt to assets.

(g) Profitability is measure by the return on assets (ROA).

(h) Valuation measured by ratio of book to market value.

(i) Industry dummies based on divisions specified in Table II.

# Table X
# Sensitivity Tests: Russian Crisis[a]

| | Base Results (1) | Redefine Sector Compet.[b] (2) | Redefine Debt Liquidity[c] (3) | Constant-Mean Return[d] (4) | Add control for Firm Size[e] (5) | Add control for Leverage[f] (6) | Add control for Profitability[g] (7) | Add control for Valuation[h] (8) | Add Industry Dummies[i] (9) |
|---|---|---|---|---|---|---|---|---|---|
| **Constant** | -0.618** | -0.623** | -0.604** | -0.618** | -0.630** | -0.616** | -0.645** | -0.628** | -0.323 |
| | (0.191) | (0.191) | (0.188) | (0.200) | (0.192) | (0.194) | (0.192) | (0.190) | (0.437) |
| **Product Competitiveness** | -0.321** | -0.235 | -0.333** | -0.321** | -0.342** | -0.317** | -0.332** | -0.344** | -0.224* |
| | (0.112) | (0.180) | (0.123) | (0.113) | (0.113) | (0.111) | (0.112) | (0.117) | (0.104) |
| **Income Effect** | -1.011** | -0.965** | -0.993** | -1.011** | -0.996** | -0.971** | -1.017** | -1.045** | -1.010** |
| | (0.277) | (0.274) | (0.277) | (0.278) | (0.277) | (0.227) | (0.277) | (0.303) | (0.276) |
| **Credit Crunch** | 0.007 | 0.003 | 0.000 | 0.007 | -0.001 | 0.022 | 0.004 | -0.023 | -0.018 |
| | (0.184) | (0.184) | (0.000) | (0.184) | (0.184) | (0.183) | (0.184) | (0.189) | (0.184) |
| **Portfolio Recomposition** | -0.094 | -0.089 | -0.097 | -0.094 | -0.119 | -0.074 | -0.101 | -0.081 | -0.087 |
| | (0.087) | (0.087) | (0.087) | (0.130) | (0.089) | (0.087) | (0.087) | (0.091) | (0.086) |
| **Country Dummies** | Yes** | Yes** | Yes** | Yes** | Yes** | Yes** | Yes** | Yes** | Yes** |
| ***# Observations*** | 7682 | 7682 | 8005 | 7682 | 7666 | 7655 | 7588 | 7197 | 7688 |
| ***Crisis Days*** | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| ***Total Days*** | 270 | 270 | 270 | 270 | 270 | 270 | 270 | 270 | 270 |

**NOTES:**

(j) Standard errors in parentheses. All variables defined in Table IV except as noted.
* is significant at the 5 percent level; ** is significant at the 1 percent level

(k) Product competitiveness is redefined using sample statistics and two-digit SIC codes. See Table VIII for details.

(l) Credit crunch is defined by the coverage ratio.

(m) Specification is a constant-mean-return model (equation 11) instead of a market model.

(n) Firm size measured by total market capitalization (in US$).

(o) Leverage is measured by the ratio of total debt to assets.

(p) Profitability is measure by the return on assets (ROA).

(q) Valuation measured by ratio of book to market value.

(r) Industry dummies based on divisions specified in Table II.

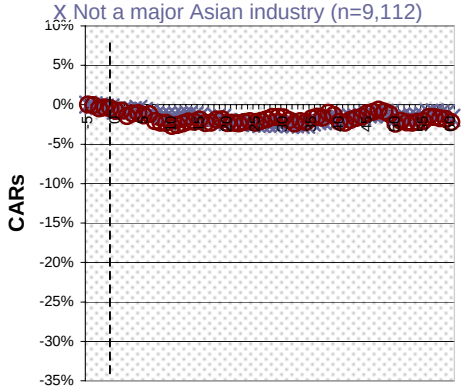
# Figures I through VI

## Asian Crisis-Phase 1

**Figure I: Product Competitiveness**

o Major Asian (1) industries (n=199)

X Not a major Asian industry (n=9,112)

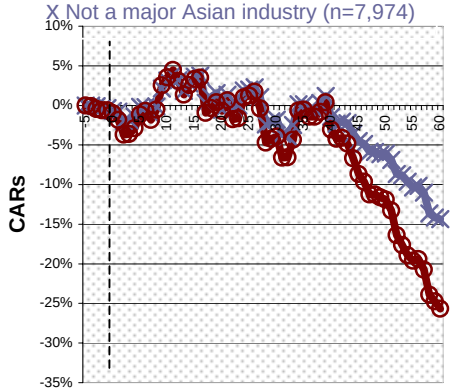



## Asian Crisis-Phase 2

**Figure II: Product Competitiveness**

o Major Asian (2) industries (n=575)

X Not a major Asian industry (n=7,974)




## Russian Crisis

**Figure III: Product Competitiveness**

o Major Russian industry (n=167)

X Not a major Russian industry (n=9,113)

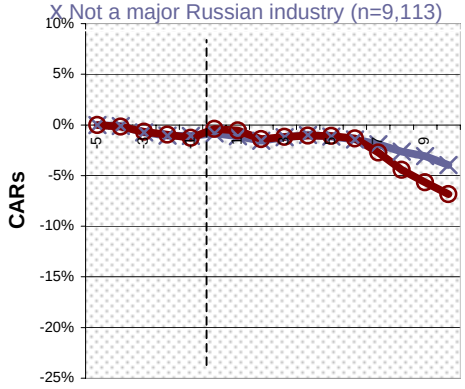



**Figure IV: Income Effect**

o Direct exposure to Asia (1) (n=50)

X No direct exposure (n=9,261)

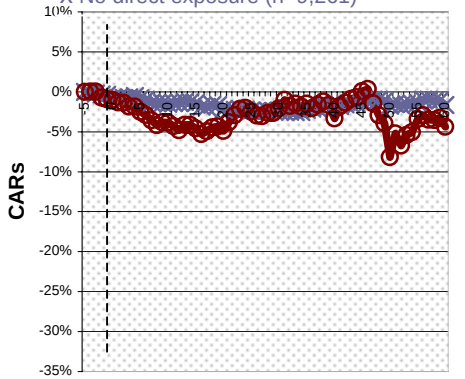



**Figure V: Income Effect**

o Direct exposure to Asia (2) (n=37)

X No direct exposure (n=8,512)

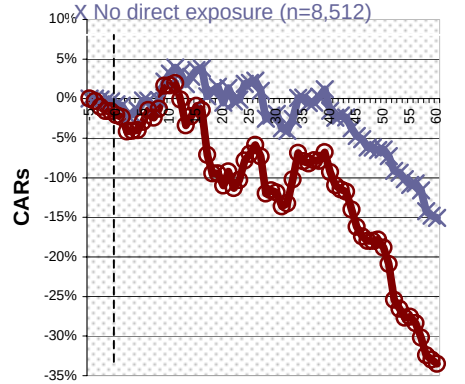
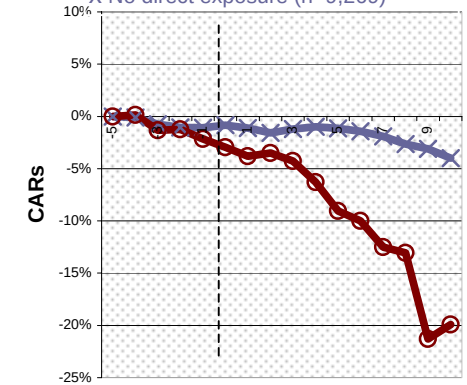



**Figure VI: Income Effect**

o Direct exposure to Russia (n=11)

X No direct exposure (n=9,269)



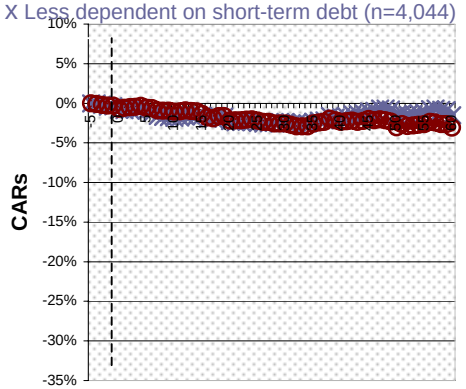
# Figures VII through XII

## Asian Crisis-Phase 1

**Figure VII: Credit Crunch**

o More dependent on short-term debt (n=3,951)

X Less dependent on short-term debt (n=4,044)

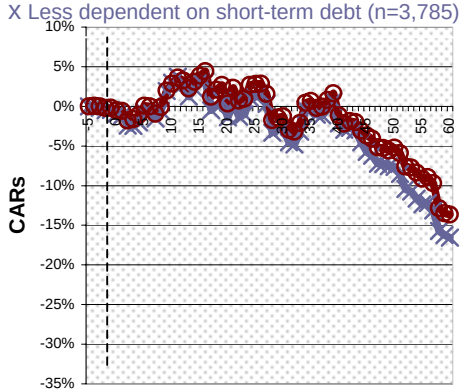



## Asian Crisis-Phase 2

**Figure VIII: Credit Crunch**

o More dependent on short-term debt (n=3,478)

X Less dependent on short-term debt (n=3,785)




## Russian Crisis

**Figure IX: Credit Crunch**

o More dependent on short-term debt (n=3,971)

X Less dependent on short-term debt (n=4,001)

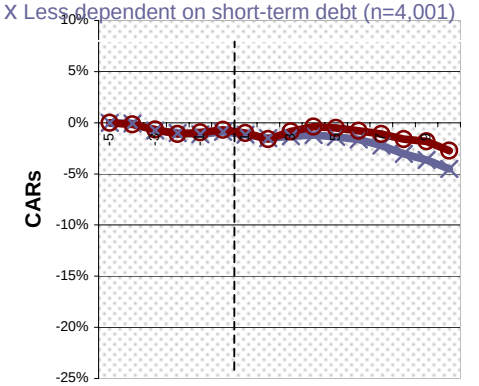



**Figure X: Portfolio Recomposition**

o Highly-liquid stocks (n=6,365)

X Less-liquid stocks (n=2,946)

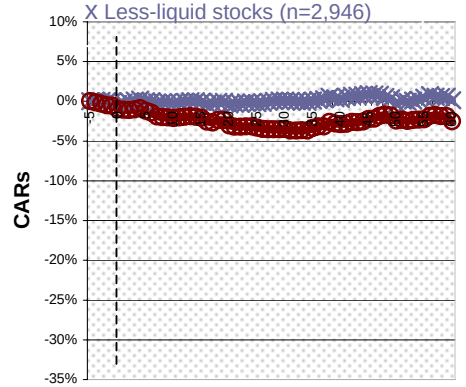



**Figure XI: Portfolio Recomposition**

o Highly-liquid stocks (n=5,860)

X Less-liquid stocks (n=2,689)

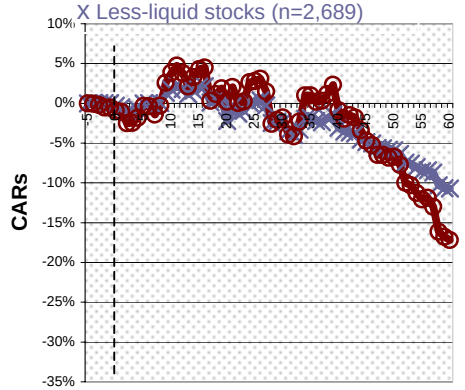
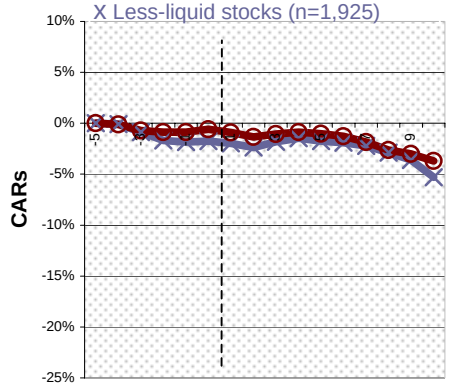



**Figure XII: Portfolio Recomposition**

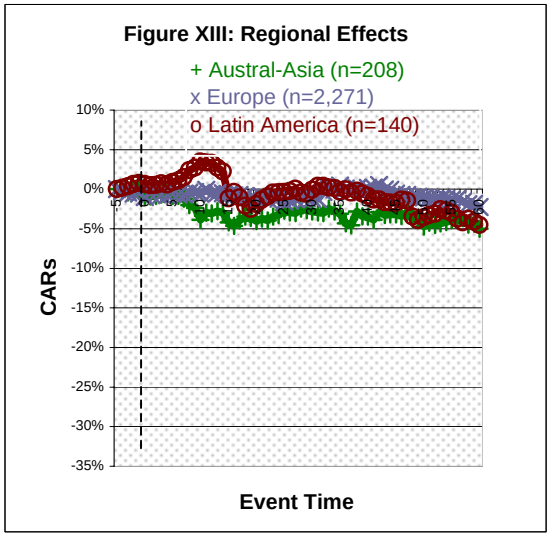
o Highly-liquid stocks (n=7,355)

X Less-liquid stocks (n=1,925)

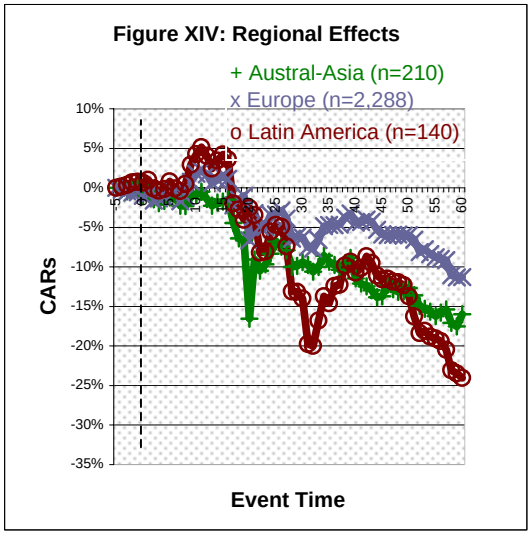


# Figures XIII through XV

## Asian Crisis-Phase 1




## Asian Crisis-Phase 2




## Russian Crisis