

CORPORATE FINANCE

R E V I E W

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HOW DO CURRENCY CRISES SPREAD INTERNATIONALLY?

Kristin Forbes

In October of 1997, Hong Kong's stock market index plummeted by 34%. Exhibit 1 shows how these events and the continuing turmoil in the rest of East Asia affected stock markets around the world. During just that one month, the Brazilian stock market index fell by 31%, and the Australian and South African market indices fell by 14%. Why did events in East Asia have such a powerful impact on the rest of the world? Why did a crisis in one region affect so many markets of such different sizes and structures located around the globe?

October 1997 is only one example of a crisis in one country or region spreading internationally. The past decade is punctuated by other examples: Britain's departure from the ERM in 1992; the Mexican peso crisis of 1994; and the Russian collapse in 1998.

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Although each of these crises was sparked by different events and occurred in fundamentally different economies, each affected countries outside of where the crisis originated. Numerous terms have been invented to describe these effects: *contagion*, *interdependence*, *the Asian flu*, *the Russian virus*, and *the Tequila effect*. Whatever term is used, however, each is meant to capture the same basic phenomenon—a crisis in one country or region can affect mar-

kets of very different sizes and structures around the world.

This article examines five channels by which a currency crisis in one country can quickly spread to other countries. It discusses the intuition behind each channel and then examines company stock returns to test for the importance of each of these channels during the Asian and Russian crises. Evidence suggests that recent crises were transmitted largely through real linkages, such as competitiveness and income effects, and not through financial linkages. These results have important implications for how companies can reduce their exposure to crises elsewhere in the world.

Over the past few years, there has been a heated debate on why crises spread internationally.¹ This article draws on these debates and focuses on how a crisis in one country could spread to firms in other countries. It categorizes these transmission mechanisms into five channels: a competitiveness effect; an income effect; a

EXECUTIVE SUMMARY

- This article investigates how a currency crisis in one country can quickly spread around the globe.
- Examined are five transmission channels and uses company information to test for the importance of each of these channels during the Asian and Russian crises.
- Evidence suggests that recent crises spread largely through real linkages, such as competitiveness and income effects, and not through financial channels.

EXHIBIT 1**Major Exports from the Asian and Russian Crisis Zones*(with corresponding SITC codes)**

Asian Crisis Zone		Russian Crisis Zone	
2862	Thorium ore, concentrates	3432	Natural gas, gaseous
2312	Natural rubber ex. latex	6727	Semi-finished iron, etc..25%+c
4224	Palm kernel oil, fractions	6831	Nickel, nickel alloy, unwrought
4223	Coconut oil, fractions	7187	Nuclear reactors, parts n.e.s.
2311	Natural rubber latex		
7633	Turntables, record players		
6343	Plywood, solely of wood		
3431	Natural gas, liquefied		
2655	Abaca, Manila hemp		
7622	Portable radio receivers		
6871	Tin, tin alloys, unwrought		
6531	Fabric, synthetic filament yarn		
0721	Cocoa beans		
8437	Shirts, mens, boys, knit		
7527	Storage units, data processing		
8512	Sports footwear		
7761	TV picture tubes, CRT, etc		
7764	Electronic microcircuits		
7638	Sound, video recording		
7763	Diodes, transistors, etc.		

*Major exports defined as 4-digit SITC industries for which exports from the crisis zone constitute 20% or more of total exports in the world.

credit crunch; a forced-portfolio recomposition; and a wake-up call.

THE COMPETITIVENESS EFFECT

The first channel through which a crisis in one country could spread to firms in other countries is through a competitiveness effect. If one country devalues its currency, that country's exports become relatively cheaper in international markets. Similar products from firms in other countries that are sold in the same markets are at a competitive disadvantage. Moreover, if exports from the initial country are a large enough share of global production in a given industry, industry prices could fall worldwide.

For example, Korea is one of the leading global producers and exporters of DRAM memory

chips. When Korea devalued the won near the end of 1997, the global price of DRAM's fell, and DRAM producers located in countries whose currency remained stable suffered a competitive disadvantage. They were forced to either lower prices or lose market share. This example shows how a product's competitiveness and its company's profitability could be damaged by a currency crisis in another part of the world.²

To test for the importance of this competitiveness channel during recent currency crises, a data set is used, containing information for over 10,000 companies in 46 countries during the Asian and Russian crises.³ The Asian crisis is defined as lasting from October 1, 1997, through December 31, 1997, and define the crisis zone as

including Hong Kong, Indonesia, Korea, Malaysia, the Philippines, Singapore, Taiwan, and Thailand.⁴ The Russian crisis is defined as starting on August 17, 1998, and lasting for 10 days, with Russia as the crisis zone.

According to this competitiveness channel, if a country has a crisis and devalues its currency, its exports gain a competitive advantage. Therefore, during and after the crisis, firms that compete with major exports from the crisis country should experience lower returns than companies that do not compete in those sectors. To test this channel, major exports from the crisis zone are defined as the four-digit SITC groups for which total exports from countries in the crisis zone are 20% or more of total exports in the entire

world. Exhibit 2 lists a selection of these industries that are major exports for each crisis zone—that is, industries that could experience a competitiveness effect during the Asian and Russian crises. (The full list of major export industries for the Asian crisis includes 128 industries.) Then, the firms in the data set are divided into two portfolios for each crisis: companies whose primary output competes with exports from the crisis zone (that is, is in the same four-digit SITC group) and companies whose primary output does not compete.

Exhibits 3 and 4 are graphs of the returns for each portfolio over 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. Exhibit 3 shows evidence of a strong competitiveness effect during the second phase of the Asian crisis (with the largest impact in November and December when the Korean won was under attack). Firms that competed with major Asian exports had average abnormal returns more than 11% lower than average abnormal returns in the rest of the sample (for the entire 60-day period). Exhibit 4 shows some evidence of a competitiveness effect during the later part of the Russian crisis, where firms that competed with major Russian exports had average abnormal returns about 3% lower (for the entire 10-day period). A company's sector of production can clearly affect its vulnerability to crises elsewhere in the world.

THE INCOME EFFECT

A second mechanism by which a crisis in one country could spread

EXHIBIT 2
Stock Market Indices During the Asian Crisis

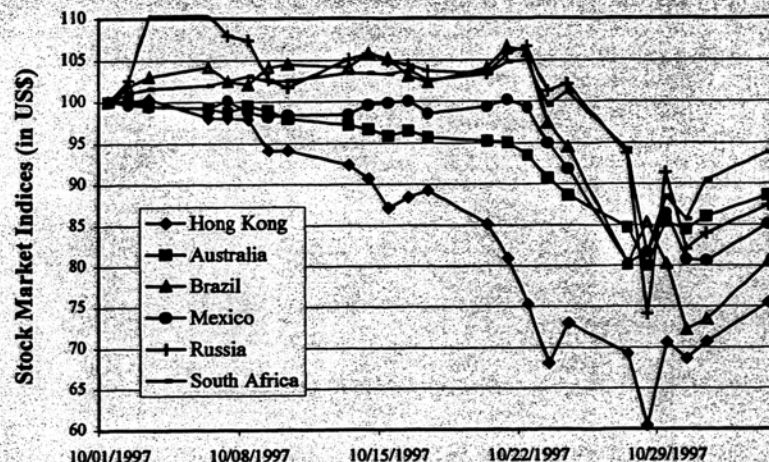
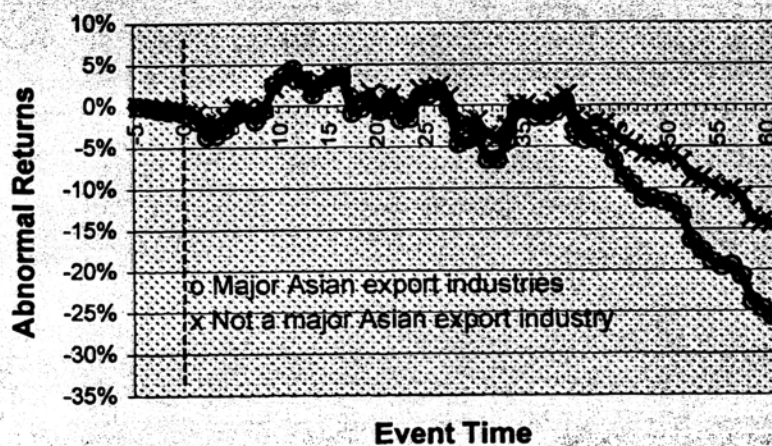


EXHIBIT 3
Asian Crisis: Competitiveness Effect



internationally is through an income effect. When a country undergoes a financial crisis, economic growth generally slows, often to the point of a severe economic contraction. Income in the crisis country falls, and any firm that exports to that country faces

a reduction in demand for its products.

For example, after the 1994 Mexican devaluation, incomes in Mexico plummeted, and firms that exported to Mexico experienced a significant drop in sales volume and profitability.

EXHIBIT 4
Russian Crisis: Competitiveness Effect

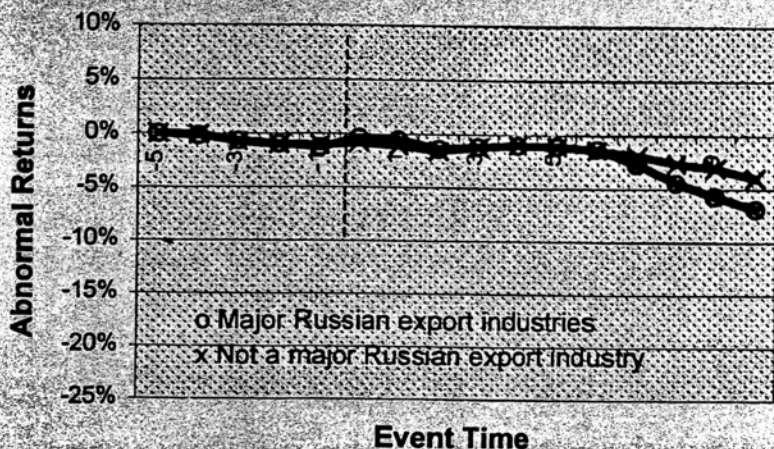
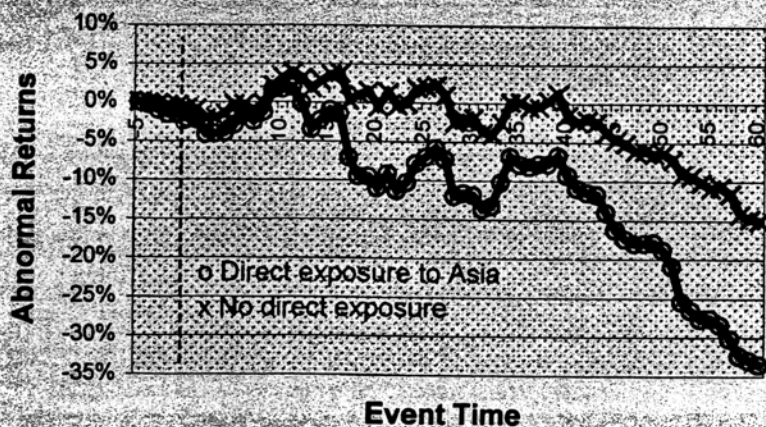


EXHIBIT 5
Asian Crisis: Income Effect



Moreover, if the initial crisis spreads to other countries (for whatever reason), this income effect could reduce demand for a firm's goods outside of the country initially subject to the crisis. This was evident as the Mexican crisis spread to Argentina, and the profitability of companies with sales exposure to Argentina was adversely affected (even if the companies

did not have sales exposure to Mexico).

To test for the importance of this transmission channel, the same data set and approach as in the previous section are used. If this income effect is important, firms with direct exposure to the crisis region through sales (or any other income sources) could be severely affected by a currency crisis and the resulting reduction

in growth. Therefore, the following are calculated: the percent of sales, operating income, and assets each firm has in the Asian and Russian crisis zones during the one-year preceding each crisis. Then, the sample is divided into two portfolios: firms that have direct exposure to the crisis zone (defined as at least 5% of assets, sales, or net income in the region) and firms that do not have direct exposure.

Exhibits 5 and 6 graph the returns for these portfolios during each crisis. These graphs show evidence of a strong income effect during both the Asian and Russian crises. Firms with direct exposure to the Asian crisis zone experienced abnormal returns about 18% lower than for the rest of this sample. Firms with direct exposure to Russia had abnormal returns about 16% lower than for the rest of the sample. One critical factor affecting a firm's vulnerability to a crisis is if that firm has direct exposure to the country or region where the crisis occurs.

THE CREDIT CRUNCH

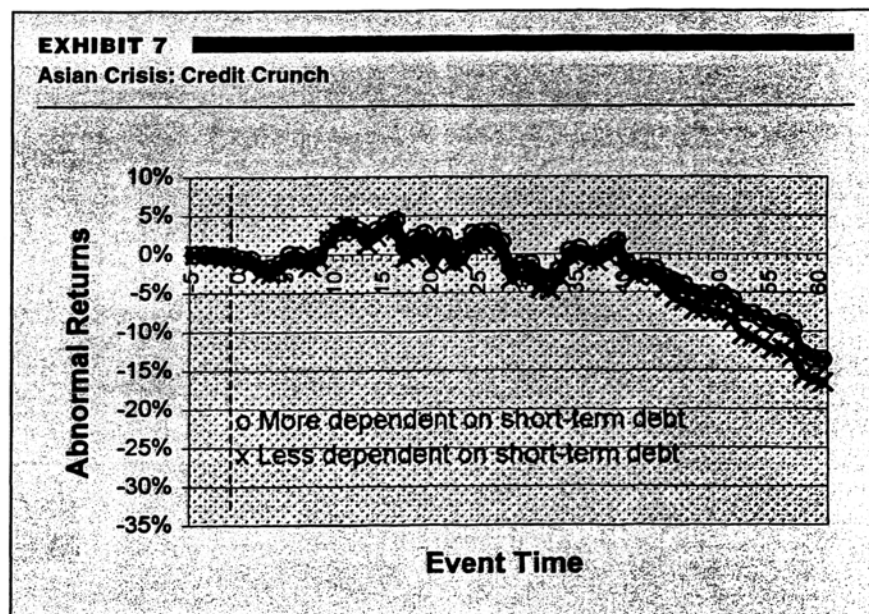
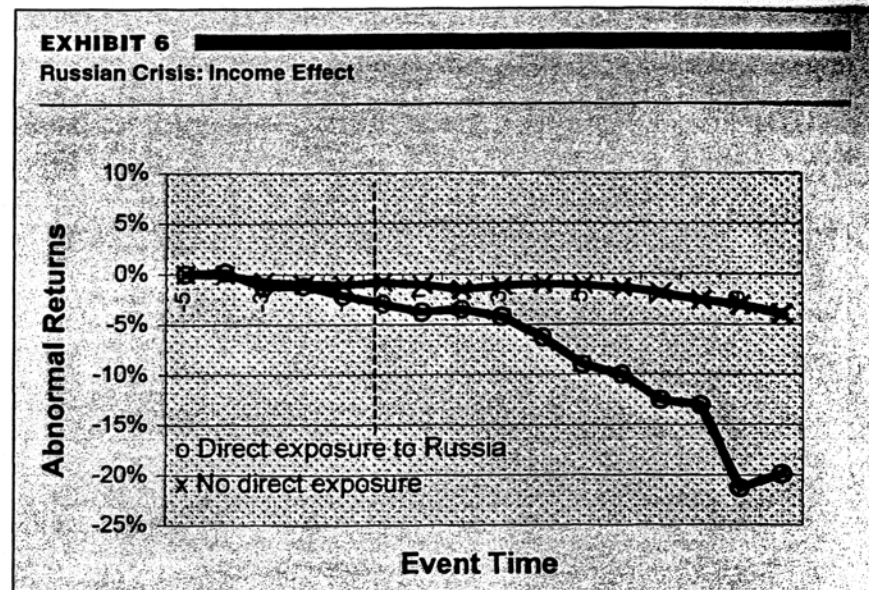
A third channel by which firms can be affected by a crisis in another country is through a credit crunch. A crisis in one country can lead to a sharp reduction in the international supply of credit, reducing financial liquidity and generating an excess demand for credit at the prevailing interest rates. More specifically, many banks supply loans to firms in several different countries. A crisis can reduce the value of assets held by the banks and cause investors in that country to withdraw their deposits from the banks. Either of these effects could reduce the value of the bank's assets and force it to liquidate loans to firms in

other countries (and possibly be unable to renew countries' financing in the future). As a result, a crisis in one country could lead to a credit crunch for firms in other countries.

The lending behavior of Japanese banks after the 1990 Japanese stock market crash provides evidence of a credit crunch. After this crash, the value of many assets held by Japanese banks plummeted, and these banks had to reduce lending in the United States and throughout Asia to meet certain regulatory requirements. The Japanese stock market crash was therefore transmitted to other countries through the credit provided by financial intermediaries.

If this transmission channel was important during recent financial crises, then companies which rely more heavily on short-term debt to finance inventories and provide working capital would be more vulnerable to a credit crunch. To test this theory, I use each company's ratio of net short-term debt to equity to divide the sample of firms (discussed above) into two portfolios: those more highly dependent on short-term financing and those less dependent.⁵

Exhibits 7 and 8 graph the stock returns for these portfolios during the two crises. These exhibits show little evidence of a credit crunch. In fact, during the Asian and Russian crises, firms that were more dependent on short-term debt had slightly higher abnormal returns than the rest of the sample—the opposite of what would be expected during a credit crunch. It is worth noting that firms more reliant on short-term debt might have lower returns during a crisis for reasons other than a credit crunch. For example, firms more



dependent on short-term debt financing could be smaller, riskier, more highly leveraged, or any combination of the three. Because these types of firms could be more vulnerable to a crisis for these reasons as well as a credit crunch, it is surprising that they were not more vulnerable to these two currency crises. This provides further evidence that a credit crunch was not important in the spread of the Asian and Russian crises.

THE FORCED-PORTFOLIO RECOMPOSITION

A fourth channel by which a crisis could be transmitted internationally is through a forced-portfolio recomposition. A crisis in one country could reduce the liquidity of investors and force them to sell assets in other markets to meet certain requirements, such as margin calls or maximum leverage ratios. A crisis in one country could also cause investors to withdraw cash from mutual funds, so fund managers are forced to sell

EXHIBIT 8
Russian Crisis: Credit Crunch

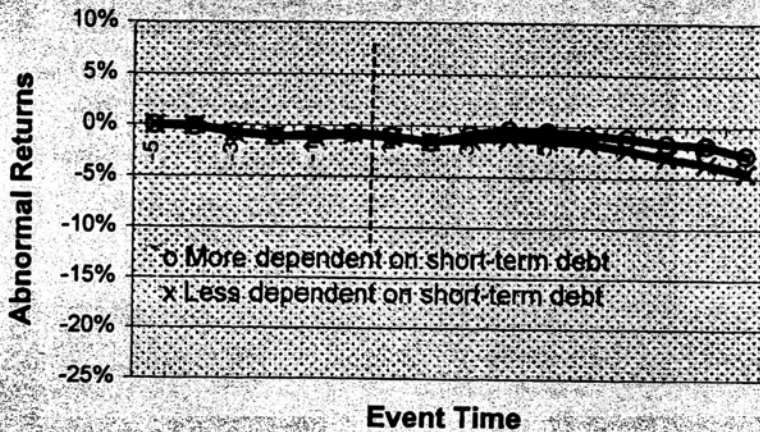
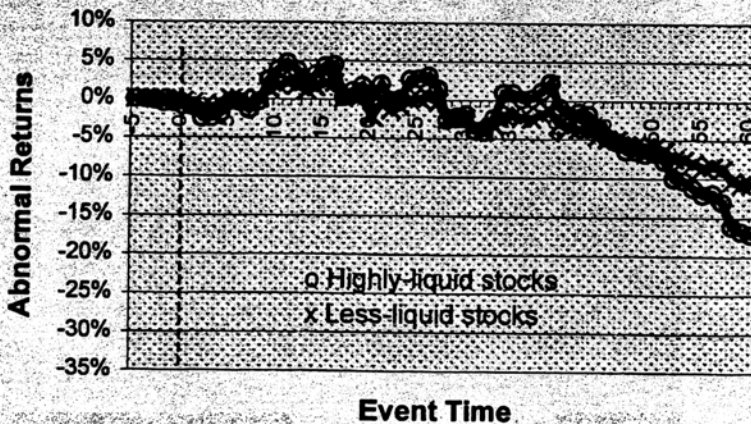


EXHIBIT 9
Asian Crisis: Portfolio Recomposition



assets in other markets to raise enough cash to fulfill these withdrawals.

More specifically, if investors owned a portfolio with investments in Russia and Latin America, the value of their Russian shares would have plummeted after August 1998. These investors may have been forced to sell their Latin American assets to continue operating in the market, satisfy margin calls, or meet regulatory

requirements. As a result, the Russian crisis could directly affect stock prices in Latin America and therefore be transmitted internationally through a forced-portfolio recomposition.

This transmission channel is difficult to test empirically. One implication of this channel, however, is that a company would be more vulnerable to a forced sell-off if a larger percent of its shares were held by institutions (such as

mutual funds) that could be subject to the regulatory requirements or cash redemptions that cause this type of portfolio recomposition. Moreover, because 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, the sample of stocks are divided into more liquid and less liquid (based on the percent of trading days for which stock returns are nonzero). Exhibits 9 and 10 graph the returns for the portfolios of highly liquid and less-liquid stocks for each crisis. During the Russian crisis, there is little difference between the two portfolios. During the Asian crisis, however, highly liquid stocks have average returns about 6% 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 Asian crisis (although less important than the competitiveness or income effect).

THE WAKE-UP CALL

A final channel by which a crisis can be transmitted to firms in other countries is through a wake-up-call effect (which is also called a country reevaluation). The basic idea behind this channel is that a crisis (or investor behavior) in one country can provide information about other countries (or how investors will behave in other countries.) The most frequent type of wake-up call occurs through a reassessment of macroeconomic fundamentals. If a country with certain macroeconomic characteristics is discovered to be susceptible to a currency

crisis, investors reassess the risk in other countries with similar macroeconomic fundamentals.

For example, before the Asian crisis there was minimal concern about the strength of the banking system in East Asia. In fact, many people argued that the reliance of Asian companies on bank loans (instead of equity) for most of their financing needs was an advantage of the Asian system. During the Asian crisis, however, the weaknesses of this system became apparent, and investors realized that these financing patterns could aggravate the impact of a currency crisis. This led investors to "wake-up" and reassess the risk in other countries with similar bank-based systems. Many people argue that this explains why a crisis in the relatively small economy of Thailand could have such major global ramifications and affect so many countries with which Thailand has little direct relationship.

Once again, it is difficult to test this transmission channel directly using this article's firm-level data set. This channel, however, has one important implication: A crisis in one country causes investors to sell investments in 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 little significant effect on firm performance. As a rough test of this channel, the sample of companies is divided into different portfolios based on the country (or region) where each firm is based, and then the returns are compared for each portfolio. This is a very imprecise test of the wake-up-call channel, because any number of country-specific effects could cause fluctu-

EXHIBIT 10
Russian Crisis: Portfolio Recomposition

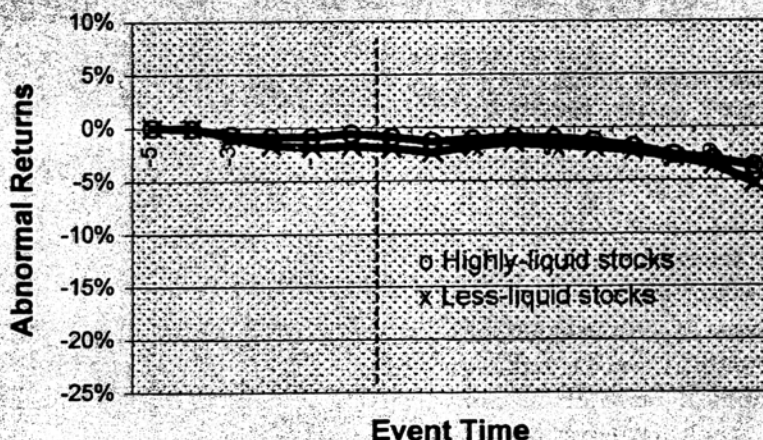
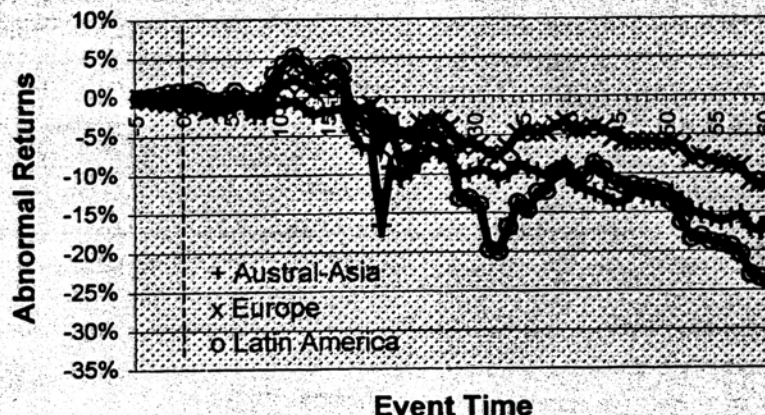


EXHIBIT 11
Asian Crisis: Regional Effects



ations in aggregate market indices. If country-specific or region-specific effects do not exist, however, the wake-up-call effect was not an important transmission channel during these crises.

Exhibits 11 and 12 show a sample of these tests and graph the returns for three regions: Austral-Asia, Europe, and Latin America. The difference across the regions is striking. During the Asian crisis,

Austral-Asia had average returns about 5% lower than Europe, and Latin America had average returns about 8% lower than Austral-Asia. During the Russian crisis, average abnormal returns for Austral-Asia were slightly positive, whereas they were close to -7% for Europe and -14% for Latin America. These graphs are far from a definitive test of the wake-up-call effect, but they do suggest that

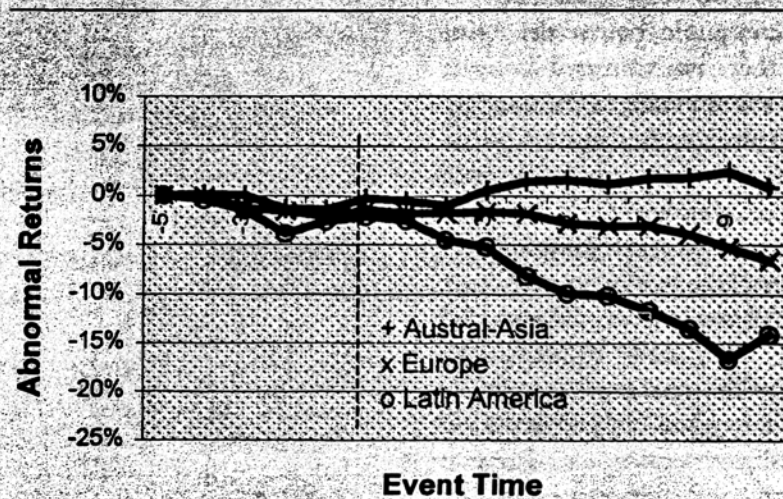
regional and country characteristics (whether a common geographical location or something else) were important during these crises.

IMPLICATIONS FOR COMPANY MANAGEMENT

This article discussed five mechanisms by which a crisis in one country (or region) can be transmitted internationally: a competitiveness effect; an income effect; a credit crunch; a forced-portfolio recomposition; and a wake-up call. Graphical evidence on companies' stock returns provides mixed support for these five transmission mechanisms during the Asian and Russian crises. There is strong evidence of a competitiveness effect and an income effect during both crises. There is no evidence of a credit crunch during either crisis, and weak support for a portfolio-recomposition effect during Asian crisis. There are strong country and regional effects during each period. These could be caused by some sort of wake-up call, or they could reflect other geography-specific characteristics or events. The author estimates a series of regressions to more formally test for the strength of each of these five transmission channels while simultaneously controlling for a number of other factors which could influence how crises spread. The regression results agree with the graphical results reported in this article.

Taken as a whole, these results have important implications for company management. The two

EXHIBIT 12
Russian Crisis: Regional Effects



channels that are most important in the international spread of crises are a competitiveness effect and an income effect. Therefore, if a company wishes to evaluate its vulnerability to future crises that occur anywhere in the world, it should carefully monitor two factors. First, what countries export goods that compete with your own products? Second, in what countries do you have a high degree of direct exposure, as measured by sales or any other sources of income? ■

Notes

1. This section of the article draws heavily from Kristin Forbes, "The Asian Flu and Russian Virus: Firm-Level Evidence on How Crises are Transmitted Internationally" NBER Working Paper No. 7807 (2000). See that paper for further information on any of these subjects. For additional surveys of this literature, see Stijn Claessens, Rudiger Dornbusch, and Young C. Park, "Contagion: How It Spreads and How It Can Be Stopped," forthcoming in *International Financial Contagion: How It Spreads*

and How It Can Be Stopped, Stijn Claessens and Kristin Forbes, eds.

- It is worth noting that there could be "secondary-product competitiveness" effects if exports from the country that 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 secondary products.
- See "The Asian Flu and Russian Virus: Firm-Level Evidence on How Crises are Transmitted Internationally" for further details on specification, sample selection, and methodology. More specifically, this article uses an event-study methodology to estimate abnormal stock returns for each company during each crisis period.
- The crisis is defined for purposes of this article as beginning in October of 1997 because there was little impact of the Asian crisis on countries outside of this region before October.
- Results are similar if other measures of debt dependence are used, such as 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; or calculate any of these ratios based on long-term instead of short-term debt.