

PART ONE

Contagion: Theory and Identification

The chapters in this section begin the exploration of financial contagion with a conceptual overview of the nature of contagion and the methods for identifying contagious episodes. The section begins with a discussion of “what is financial contagion?” Perhaps, surprisingly, there is not a simple answer to this question. However, there does seem to be a widespread view that the key to understanding contagion lies in the concept of correlation.

Contagious episodes seem to be characterized by a change in the correlation between affected domains, whether those are particular financial instruments, markets, or economies. For some scholars, there is no contagion without an increase in correlation. However, the problem of identifying contagion is more complicated than merely identifying an increase in correlation.

An increase in volatility of prices will cause correlations to increase generally. So a mere increase in volatility should not count as proof of contagion according to many experts working in this area. On this view, the problem of identifying contagion then turns on measuring the jump in correlation that is not merely a function of heightened volatility, but that depends on linkages between the affected domains. Further, some experts on contagion want to distinguish between genuine contagion and what they would characterize as mere interdependence.

This section also inaugurates an examination of the particular mechanisms that allow economic problem to spread. One of the clearest channels of contagion is a trade relationship between two nations, such that economic difficulty in one nation quickly becomes a problem for its trading partner.

A conceptual treatment of contagion and the identification of contagious episodes ultimately requires a particular context for its full analysis. Accordingly, some chapters in this section consider the problem of contagion in a variety of concrete episodes, episodes that are the subject matter of many subsequent chapters: the Russian default of 1998, the Brazilian crisis of 1999, the dot-com crisis at the beginning of the twenty-first century, the long-lived Argentine crisis from 2001 to 2005, and, of course, the financial crisis of 2007–2009.

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CHAPTER 1

What Is *Financial Contagion*?

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The phrase *financial contagion* draws on a concept whose root meaning lies in the field of epidemiology. Like almost all metaphors, this one has the power to illuminate and to mislead. Its referent is the spread of financial distress from one firm, market, asset class, nation, or geographical region to others. But, *contagion* carries with it other burdens of meaning. First, to refer to *contagion*, instead of merely to an *epidemic*, is to implicitly assert that there is a mechanism of transmission from one infected victim to other potential victims. For example, bubonic plague and malaria may give rise to epidemics, but these diseases are not contagious, being transmitted by the bite of a flea and the sting of a mosquito, rather than being spread from one infected party to another. By contrast, some epidemics may be the result of truly contagious diseases in which the disease spreads directly from one victim to another through the direct transmittal of a pathogen, such as is the case with tuberculosis and AIDS. Second, because a contagious disease spreads from one infected host to others by some mechanism, the key to understanding such a malady is to comprehend the method of transmission. Finally, by invoking a metaphor of illness, *financial contagion* implies an economic disorder, dislocation, or disease.

Contagion is a fairly new concept in the economics literature—before 1990, it was scarcely mentioned (Edwards 2000, p. 1). Early interest in the concept stemmed from international finance, particularly the finance of emerging economies, and concern about contagion was exacerbated by the Asian financial crisis of 1997–1998 (Hunter, Kaufman, and Krueger 1999). Because concern originated in the international arena, the idea of transmission of financial difficulties across national borders has always had a prominence in discussions of contagion. But the financial crisis of 2007–2009, which inaugurated the subsequent Great Recession, provided powerful evidence that contagion was not a phenomenon limited to emerging markets or the arena of international finance.

Although there is little agreement about the meaning of *contagion*, much has been written about the channels of contagion, or the mechanisms by which financial distress originating in one source spreads to other victims. The problem here is to identify the channels of contagion or the means by which financial distress spreads from one arena to others. In some instances, financial difficulties percolate slowly and only gradually affect other markets or nations. In other situations, financial

distress spreads like the most virulent of infectious or contagious diseases. Notice also that the so-called *channels of contagion* matter both for the spread of financial distress when the transmission is conceived on the epidemic model (like bubonic plague and malaria) or on the truly contagious model (like tuberculosis or AIDS).

There is some danger of conflating contagion with the evidence of contagion. That is, there is a risk of taking evidence of contagion as the malady itself. According to many studies, a contagious episode in finance typically results in a particularly heightened correlation among the affected domains. For example, if a financial crisis arises, the stock returns of two financial firms may suddenly start behaving more similarly than they did in the pre-crisis period. Although increased correlations may provide a method for identifying the occurrence of a contagious episode, the jump in correlations is hardly contagion per se.

These issues—alternative conceptions of contagion, the channels of contagion, and methods for identifying contagion—are key to understanding financial contagion. This chapter addresses each of these fundamental problem areas in turn.

THE CONCEPT OF CONTAGION

There is no settled meaning for *contagion* in finance. Some scholars fully embrace the disease metaphor: “One theory is that small shocks which initially affect only a few institutions or a particular region of the economy, spread by contagion to the rest of the financial sector and then infect the larger economy” (Allen and Gale 2000, p. 2). For others, contagion is merely the diffusion of financial stress, without connotations of disease: “the spread of financial difficulties from one economy to others in the same region and beyond in a process that has come to be referred to as ‘contagion’” (Caramazza, Ricci, and Salgado 2004, p. 51).

In “A Primer on Financial Contagion,” Marcello Pericoli and Massimo Sbracia consider five definitions of contagion that reflect the wide variety of meanings ascribed to this term. “1. Contagion is a significant increase in the probability of a crisis in one country, conditional on a crisis occurring in another country. . . . 2. Contagion occurs when volatility of asset prices spills over from the crisis country to other countries. . . . 3. Contagion occurs when cross-country comovements of asset prices cannot be explained by fundamentals. . . . 4. Contagion is a significant increase in comovements of prices and quantities across markets, conditional on a crisis occurring in one market or group of markets. . . . 5. Contagion occurs when the transmission channel intensifies or, more generally, changes after a shock in one market” (Pericoli and Sbracia 2003, pp. 574–575). These five definitions exhibit substantial conceptual differences. For example, the first is defined as a change in probabilities of a crisis, while the second focuses on a change in volatilities. Similarly, the first seems to pertain only to international financial contagion, while the third speaks of markets or groups of markets.

On some understandings, the speed with which financial distress spreads is critical. For Kaminsky, Reinhart, and Végh (2003), contagion is “an episode in which there are significant *immediate* effects in a number of countries following an event—that is, when the consequences are *fast and furious* and evolve over a matter of hours or days” (p. 55). They also acknowledge that there are similar events in

which the spread is gradual, but these they regard as *spillovers*, not instances of contagion.

For many scholars, a change in the correlations among economic variables is a key. This is reflected in the third and fourth definitions listed by Pericoli and Sbracia. For their part, Kaminsky, Reinhart, and Végh (2003) make this an explicit additional condition in their definition of contagion, saying "Only if there is 'excess comovement' in financial and economic variables across countries in response to a common shock do we consider it contagion" (p. 55).

Kristin J. Forbes and Roberto Rigobon (2002) make this idea of correlation or changes in correlation the centerpiece of their understanding of contagion. Acknowledging a widespread disagreement over the meaning of contagion, they note that increased correlation has been taken as evidence of contagion. But for Forbes and Rigobon the matter is more complicated. Consider a major economic shock affecting one country or market. Such an event can raise volatility in financial markets generally, and heightened volatility, *by itself*, can cause an increase in measured correlation. For Forbes and Rigobon, such an increase in measured correlation is not an indicator of contagion. Instead, they regard contagion as reflected by an increase in correlation among asset returns, after discounting any such increased correlation that is due to an increase in volatility.

The core idea is that such an increase in correlations, properly measured, reflects an increase in linkages across markets or countries, and a change in the economic linkages are the key in their definition: "This paper defines contagion as a significant increase in cross-market linkages after a shock to one country (or group of countries)" (Forbes and Rigobon 2002, p. 2223). If the episode is truly one that exemplifies contagion, there will be an increased correlation among returns of the affected entities, even after discounting the measured correlation for the increased correlation due to heightened volatility. On this definition, Forbes and Rigobon argue that there was virtually no contagion during the 1997 Asian crisis, the 1994 Mexican peso devaluation, or the market crash in U.S. markets in October of 1987, all episodes that many others had identified as contagious episodes.

Others have followed or even extended the intuition of Forbes and Rigobon. Geert Bekaert, Campbell Harvey, and Angela Ng (2005) define contagion as "excess correlation, that is, correlation over and above what one would expect from economic fundamentals," and they assert that "Contagion is a level of correlation over what is expected" (pp. 40, 65). For those who adopt this framework of thought, the idea is that a model of asset returns provides a gauge of how an asset should behave based on other variables. Thus, the model gives an expected return for the asset being modeled. If we have special confidence in our model, we might even be tempted to think (even if we are not bold enough to say) that the model tells us how returns of the asset ought to behave, or what the rational behavior of those returns would be. In this framework of thought, contagion occurs when correlations jump to a level that is beyond what the model tells us to expect regarding correlation or what the model tells us is the rational level of correlation. Contagion, viewed as a departure from the normal, the expected, or the rational, taps the disease dimension of the contagion metaphor. This line of thought has seemed attractive to quite a few researchers, but it threatens implicitly to define contagion as that which is inexplicable on our ordinary understanding.

Thus, requiring heightened correlation not due to an increase in overall volatility and/or not due to economic fundamentals sets a high evidentiary bar for identifying contagion. On such criteria, many episodes that seem to have been instances of contagion are disqualified. Corsetti, Pericoli, and Sbracia (2005) attack this literature exactly on the grounds of setting an unrealistically difficult test for finding correlation. These findings of interdependence, but no contagion, they assert “follow from arbitrary assumptions on the variance of the country-specific noise in the markets where the crisis originates—assumptions that bias the test towards the null hypothesis of interdependence” (p. 1178).

In many cases, people who live through crises experience these financial episodes as exemplifying contagion. Against this background, a definition of contagion that disqualifies almost of all of these events fails to be useful in understanding people’s experience. By the same token, it must be possible for people to experience a financial crisis as exemplifying contagion and for them to be mistaken. Otherwise, the effort to define *contagion* would be pointless. To truly identify some financial catastrophe as a contagious episode really turns on being able to specify the mechanism by which financial distress is propagated. Understanding how financial distress spreads will throw additional light on the concept of contagion and will be important in distinguishing true from merely apparent instances of financial contagion.

CHANNELS OF CONTAGION

It is at least possible to imagine widespread financial distress that is not the result of contagion. For example, if a large asteroid were to strike the earth, the economic consequences would be extremely large and widespread. But this would not be an episode of contagion on many definitions, because there would not be a transmission of financial distress from one stricken domain to another. Instead, in this example, all of the distress stems from an exogenous common source. Similarly, the outbreak of widespread war might cause dramatic financial losses in many markets, but it would hardly constitute an example of contagion. Thus, widespread financial distress that results from some event external to the economy will not be seen as an instance of contagion, generally speaking.

Some channels of contagion seem clear and easy to understand. For example, a trade link between two countries stands as the most obvious avenue of transmission for financial difficulties from one country to another. Consider two adjacent countries with strong trade links. If one of these countries experiences an internally generated economic crisis, due perhaps to a coup or civil war, that country will suffer large economic effects on the production of export goods and on the demand for goods from its trading partner. This disruption in trade can have profound and virtually immediate effects on its trading partner, and such a situation seems to be a clear instance of contagion. Here financial difficulties in one country arise, and we can understand quite readily how those difficulties can be transmitted to another country through trade linkages.

Although financial ties are not as directly palpable as a trade linkage, they also provide a fairly clear means by which financial difficulties in one country (or firm) can be transmitted to another. Assume that country A is a large creditor of

country B. Country B experiences internally generated economic difficulties that make it apparent that it will not be able to pay its creditors as promised. In this case, country A sustains large losses and experiences its own financial distress. The financial difficulties in country B are then transmitted to country A through these financial linkages.

These examples rest on changes in real economic activities or changes in cash flows from financial assets. By contrast, much financial distress can arise more or less immediately from a change in perceptions, no matter whether those perceptions are grounded in reality. For example, consider a situation in which the public witnesses a run on a particular bank without knowing anything about the true condition of the bank suffering the run. Observing the run on this bank might make depositors at other banks fear the soundness of their own banks. Faced with this new uncertainty about the soundness of other banks, depositors might run to withdraw funds from their own accounts, even though they have no independent reason to question the soundness of their own banks. In this example, the financial difficulties at the first bank led to financial difficulties at other banks, but the transmission mechanism was due entirely to a shift in public perceptions. There may well have been no real difficulty at the first bank, and there may have been no financial linkages between the first bank to suffer a run and the other banks. Yet, financial difficulties at the first bank can lead to financial difficulties at other banks through a mechanism that can be specified quite clearly.

Closely allied to the bank run example is a situation in which investors see a variety of countries, firms, or assets as similar. Assume that investors in one particular asset realize that the value of that asset is much lower than previously thought. Further, assume that this information becomes public. Given the reduced value of the first asset, one may quickly come to view other similar assets as overpriced. This can lead to a rapid reassessment of the value of these other assets. In some sense, the financial difficulty in the first asset is transmitted to others through the medium of changed investor perceptions. In this example, the information about the first asset was true. This kind of potentially contagious event is referred to as a *wake-up call*. The perception of a lower value for the first asset awakens investors to the true economic value of other assets. It seems that part of the Asian financial crisis of the late 1990s stemmed from such a wake-up call when a realization that the Thai baht was overvalued led investors to question the value of other Asian currencies. As a result, financial difficulties in Thailand were quickly replicated in other Asian countries.

A sudden reassessment of asset values played an important role at a crucial juncture in the financial crisis of 2007–2009. Many financial firms had long been under suspicion and had suffered major depreciation in their stock prices. In a single week, from September 15 to 21, 2008, all major investment banking firms left the industry: Lehman Brothers filed for bankruptcy on September 15, and Bank of America absorbed Merrill Lynch on the same day. The week before, Fannie Mae and Freddie Mac had become explicit wards of the federal government, driving their share prices nearly to zero. On September 16, AIG, formerly the only triple-A financial firm in the United States, received a federal guarantee of support to the tune of \$85 billion. After these events, it was clear to many that the financial difficulties just experienced by all of the largest financial firms in the United States

would now focus on the only two significant investment banks still surviving, Goldman Sachs and Morgan Stanley. Fearing their own demise, both firms petitioned the Federal Reserve to become bank holding companies to secure a virtually bottomless pool of financing, while succumbing to increased regulation.

Widespread financial distress often has many sources. For example, the origins of the Great Depression remain a subject of continuing debate—in part because it had so many disparate causes. In many instances, various sources of financial distress and contagion operate together. In their book *The Panic of 1907*, Robert F. Bruner and Sean D. Carr explain how financial difficulties began with a purely external event, the great San Francisco earthquake and fire of 1906. This catastrophe led to economic dislocations in the real economy, leading to financial effects by affected companies and individuals. Troubles were furthered by an attempted stock market manipulation, which itself had widespread consequences. Before long, financial difficulties engulfed the world.

The financial crisis of 2007–2009 had many causes that will be debated for a long time, and the role of contagion in transitioning from a subprime real estate problem in the United States to a worldwide recession and widespread financial distress will long be debated. However, most accounts of the financial crisis and ensuing Great Recession acknowledge the role of long-standing U.S. policies to promote homeownership, an enduring policy of easy money and low interest rates at the macro level, along with corruption, dishonest mortgage practices, and a hubris with respect to very complex financial instruments, among still other factors (Kolb 2010 and Kolb 2011, especially Chapters 9–13).

The complexity of large-scale and widespread financial dislocations makes it almost certain that many observers will find a role for financial contagion in explaining how the disaster spread so quickly, widely, and completely. But the very size and complexity of these financial crises also makes it extremely likely that much more was in play besides a merely contagious episode. The fact that contagious financial distress is often embedded in a more complex context makes it difficult to identify and isolate the contagion that appears to be a central part of the story.

IDENTIFYING CONTAGIOUS EPISODES

Those who live through large-scale financial dislocations, and especially those leaders charged with responding to them have no trouble in identifying the episode as being one of contagion, but sometimes they are not seen until they already have an effect. Laura Tyson, former Chair of the Council of Economic Advisors, speaking on the role of Thailand in the Asian financial crisis, said: “Thailand is a very small economy. It didn’t have a lot of links, and it’s not exactly in your backyard. So in any event, the U.S. chose not to intervene in Thailand [while the baht was under pressure in 1997], thinking it was not going to spill over. Why would it? The contagion effects were not apparent to anybody, not just the administration” (Yergin and Cran 2003).

Yet the contagion was soon apparent to policy makers in this episode and we find William McDonough, then President of the Federal Reserve Bank of New York saying: “From about the first of February until the beginning of August [1998], there was a period in which financial markets essentially decided that risk didn’t

exist anywhere," but then Russia defaulted in August 1998 and McDonough continues: "All these people who in the previous seven months had decided there was no risk anywhere literally panicked and decided there's got to be massive risk everywhere. Behind each fence and barnyard wall there must be a risk that we hadn't thought of, you know, like the redcoats retreating from Lexington" (Yergin and Cran 2003). One could hardly ask for a clearer account of contagion conceived as a "wake-up call" exemplified by rapidly shifting investor perceptions. Thus, the contagion was clearly evident to these policy makers faced with responding to the Asian financial crisis, as it was to the new set of policy makers forced to deal with the financial crisis of 2007–2009.

However, economists tend to believe that actual contagion should be discernible in economic data. We have already discussed the main tool that economists use—the examination of changing correlations among asset return behaviors, sometimes adjusting those correlations by using sophisticated econometric techniques.

Yet one must wonder if the economists' toolkit is adequate to the challenge of identifying contagion. First, contagion is often examined against the background of larger crises, a context that may make the identification of contagion particularly difficult. Further, there seem to be many avenues for the spread of financial difficulty. Although some, like direct trade and financial links, may be fairly easy to trace, a sudden widespread shift in investor perceptions may be virtually instantaneous and leave few traces in the historical data. For example, there can be little doubt that Goldman Sachs and Morgan Stanley terminated their existence as investment banks as a direct result of the financial difficulties that took Lehman Brothers to oblivion and induced Merrill Lynch to throw itself into the arms of Bank of America. Yet those events were separated by barely a week, hardly enough time to create an economic record that would statistically show the contagion that economists labor to discern.

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He has published more than 50 academic research articles and more than 20 books, most focusing on financial derivatives and their applications to risk management. In 1990, he founded Kolb Publishing Company to publish finance and economics university texts, built the company's list over the ensuing years, and sold the firm to Blackwell Publishers of Oxford, England in 1995. His recent writings include *Financial Derivatives, 3e*, *Understanding Futures Markets, 6e*, *Futures, Options, and Swaps, 5e*, and *Financial Derivatives*, all co-authored with James A. Overdahl. Kolb also edited the monographs *The Ethics of Executive Compensation*, *The Ethics of Genetic Commerce* and *Corporate Retirement Security: Social and Ethical Issues*, and (with Don Schwartz) *Corporate Boards: Managers of Risk, Sources of Risk*. In addition, he was lead editor of the *Encyclopedia of Business Society and Ethics*, a five-volume work.

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