Contagion: Evidence from the Bond Market

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Abstract

Using Treasury and corporate bond market data, I examine the propagation of firm-specific shocks as well as market-wide shocks between 1995-2003, testing the implications of previously proposed channels of contagion. I find little support for the economic fundamental hypothesis. Consistent with the information transmission and liquidity-shock hypotheses, I find evidence of flight to quality during the event periods. However, in contrast to the prediction of the liquidity shock hypothesis, the corporate bond market seems to be more liquid during event periods. These findings are more in favor of the information channel as a means of inducing contagion.

JEL Classification: G14, G22, G33

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The 1990s has been a period of an increasing number of financial crises. Moreover these events spread rapidly across the globe, leading to serious concerns regarding the stability of financial markets. For example, the impact of the Mexican peso collapse of 1994 (tequila crisis) was felt in a number of other Latin American countries. The Thai crisis of 1997 (Asian flu) initially impacted the Asian Tigers, and then propagated to other developing regions of the world as far as Latin America. The Russian default in the summer of 1998 (Russian virus) and the subsequent fall of LTCM, resulted in the collapse of numerous financial intermediaries throughout the world.[1] Furthermore, there was a substantial drop in market liquidity across several unrelated markets, and a movement of investors towards safer and more liquid assets (flight to quality and liquidity). This turmoil in financial markets prompted a coordinated research effort by the central banks of developed nations and the Bank of International Settlements to understand the determinants of market liquidity, and to design preventive policies for the future.[2]

In recent years, there were also a number of domestic shocks that rippled through the markets, causing falling prices, widening spreads, and flight to quality trades. These shocks were market-wide, such as the burst of the internet bubble and the September 11th terrorist attacks, or company-specific (collapses of firms such as WorldCom, Conseco, Enron, and United Airlines). According to Moody's Default Studies,[3] in 2002 36 issuers with individual debt obligations of at least $1 billion defaulted worldwide. The average real size of default was $1.7 billion, four times the 1983-2001 average. Roughly 34% of the total dollar volume came from firms that held investment-grade status within a year of default. Furthermore, years 2001 and 2002 yielded the highest percentage of issuer downgrades.[4] A recent example of such an event is the downgrade of General Motors and Ford Motor Cos. to 'junk' status. Their troubles had a broad impact on the corporate bond market, widening spreads, and pushing down the yield on Treasury securities. As Steve Rodosky mentions: "It's obviously a flight to quality trade that we are seeing."[5] Furthermore, questions remain as to the reasons why we observe these episodes. Tony Crescenzi points out: "The question here is: Is GM a company-specific problem or a market problem?"[6]

The empirical literature on financial market spillovers and contagion has mainly focused on examining the effects on stock market returns.[7] The emphasis of many of these papers centers on whether contagion does indeed exist in the markets, and how it should be measured.[8] However, the literature does not address sufficiently the reasons for the propagation of these shocks.[9] Although a number of models have been used to explain these episodes, no propagation mechanism has yet emerged as the dominant channel empirically. These models can be grouped into three broad categories: contagion due to economic fundamentals, liquidity shocks that "dry up" the market, or information transmission due to an update or dispersion of beliefs of investors.[10] Furthermore, some of these theories were designed to address stylized facts from the international and domestic equity markets. This ex-post approach is vulnerable to the following critique - that maybe they can only explain that specific event. Important, unanswered questions include: What is the dominant channel of propagation of a shock during a time of crisis? Can these models be applied to explain the propagation of other types of shocks, or applied to other types of financial markets? This paper addresses these issues by bringing a new data set (U.S. Treasury and corporate bonds) and examining the propagation of market-wide (stock market downturns) and firm-specific shocks (major defaults and credit rating downgrades to 'junk' status) between 1995-2003, testing the implications of the above-mentioned channels of contagion.[11] To achieve this, I observe several trends and market characteristics during the event periods that are of ever-increasing importance to policy regulators, such as the flight to quality and liquidity as well as the levels of market liquidity.[12] The time span and type of shocks that I am examining covers most of the major international and domestic shocks of recent years. Information on the corporate bond market is obtained using a large panel data set that comes from the Fixed Investment Securities Database (FISD) and National Association of Insurance Commissioners (NAIC) transactions data.

The use of bond data has some extra advantages and provides a natural setting to test theories of contagion. For example, some of the models that I examine deal with firm-specific events that are directly related to the bond market. Thus, given these types of shocks, corporate debt offers a natural setting for examining their propagation. Furthermore, using corporate bond data seems to be more appropriate in testing the liquidity-shock model and examining the impact of liquidity, as it is substantially less liquid than the equity or Treasury markets.

The key findings can be summarized as follows: First, examination of shocks on industry rivals, even after controlling for the industry concentration, shows only a slight widening of their yield spreads, suggesting fundamentals do not generate contagion. Second, there is evidence of flight to quality during event weeks, consistent with the information transmission and liquidity shock theories. Specifically, the two-year Treasury note rate typically decreases 4bp while corporate spreads go up 3bp and 21bp for the investment-grade and high-yield market, respectively. Third, contrary to the predictions of the liquidity-shock theory, the corporate bond market is actually more liquid during event periods. This is shown by a higher level of trading volume, frequency, and mean bond age during event periods, compared to non-event periods. The higher level of trading volume and frequency is consistent with the information transmission theory of contagion. It can be the outcome of dispersion or update of beliefs of market participants.

The remainder of the paper is organized as follows. Section I discusses the relevant literature, both theoretical and empirical, and presents the hypotheses. Section II describes the data sources and sample of events. Section III discusses the framework used for analyzing the spillover effects. Section IV concludes.

I. Related Literature & Hypotheses

A. Contagion due to Economic Fundamentals

This channel of propagation posits that contagion can be the outcome of economic fundamentals between firms or markets. For example, Lang and Stulz (1992) and Jarrow and Yu (2001) predict that a firm-specific shock can have a negative impact on the firm's suppliers and customers, while the effect on the rival firms depends on the level of concentration within the particular industry. More specifically, a firm-specific shock in less concentrated industries can have a negative impact on rival firms because it reveals negative information about the components of cash flows that are common to all firms in the industry, the *contagion effect*. However, in more concentrated industries, these firm-specific events can have a positive impact on rival firms because of redistribution of wealth from the distressed firm to its competitors, the *competitive effect*. For suppliers and customers, these events will probably have a negative effect, especially in cases of strong ties to the distressed firm.

Empirical evidence on the rivals' stock price [Lang and Stulz (1992)] supports the above predictions. Jorion and Zhang (2007) extend the work of Lang and Stulz (1992) using a larger sample and examine the intra-industry impact using credit default swap data. Furthermore, they distinguish between three type of events: Chapter 11 and Chapter 7 bankruptcies, as well as extreme upward jumps in spreads. Their findings suggest that Chapter 11 fillings produce contagion effects, while Chapter 7 cause competitive effects. The most severe credit contagion is caused however by the jump events. Hertzel, Li, Officer, and Rodgers (2006) examine the impact of distress events along the supply chain (customers and suppliers). The events used in this study include both the filing date, as well as a *pre-filing* date (identified by finding the date within a year prior to the Chapter 11 filing date that the firm experienced the largest negative dollar abnormal return). Confirming the above predictions, their findings show that the supply chain is negatively affected both during the pre-filing as well as during the filing period.

To test this channel, I use the following hypothesis:

(H1) For less (more) concentrated industries there is a widening (narrowing) of the yield spread of rival firms following firm-specific events.

B. Information Transmission

The information asymmetry framework has been employed by numerous models as a way to explain the initial crisis as well as the subsequent contagion. For example, King and Wadhwani (1990) provide a framework where rational agents transmit a shock from one market to another because they have imperfect information and cannot distinguish an idiosyncratic from a systematic shock. Gennotte and Leland (1990) present a model where incomplete information regarding the hedging programs of market participants can create the crisis. Romer (1993) develops two models to show that prices can move rationally, without the existence of external news. The first model is based on uncertainty on the part of some investors regarding the information that others possess. The second model is based on dispersion of the relevant information among market participants and an imperfect aggregation by the market. Calvo (1999) provides a model of constrained asymmetric information that focuses on the impact of trades rather than prices. In his setting, informed investors are subject to margin calls and might be forced to sell emerging market securities. Uninformed investors observe these trades and may be mislead by this action. Thus they might wrongly infer that emerging markets provide low returns. Their response is to exit these markets, move to safer assets and create contagion.

In the same spirit, Kodres and Pritsker (2002) develop a rational expectations model with asymmetric information. In this framework, the shock is transmitted from one market to others because of the rebalancing activities of investors. Hong and Stein (2003) provide a theory where differences of opinion among market participants coupled with short-sale constraints can result in market crashes and contagion. Barlevy and Veronesi (2003) describe a model for stock market crashes again based on asymmetric information. In their setup, uninformed traders infer that a price drop might imply negative information regarding the security's fundamentals to the informed market participants. Their response is to reduce further their demand and thus create the market crash. Collin-Dufresne, Goldstein, and Helwege (2004) propose a model where contagion within the bond market propagates through a Bayesian updating of beliefs. They also empirically show that credit events, captured by a jump of 200 basis points of an individual firm, lead to market-wide increases in credit spreads. Yuan (2005) proposes an information asymmetry framework coupled with borrowing constraints that creates crisis and contagion. Pasquariello (2007) presents a model where heterogeneity of private information among informed investors can create wrong inferences regarding fundamental values, and could lead again to contagion. In the same spirit, Kallberg and Pasquariello (2007) empirically show that information heterogeneity (proxied by the dispersion of analysts' earnings forecasts) explains a significant portion of the excess comovement among U.S. stock industry indexes.

To examine empirically the information channel, I am utilizing trading volume and frequency in the corporate bond market to capture the information transmission. Trading volume refers to the actual amount transacted, while trading frequency refers to the number of transactions. Abnormal trading volume has been associated in the past with dispersion of beliefs, or lack of consensus, among traders [Beaver (1968)].[13] In this framework, trading is a result of disagreement, or differential information, among market participants [He and Wang (1995), Kim and Verrecchia (1997)]. For example, prior empirical studies in the finance and accounting literature have shown that the informational role of trading increases following macroeconomic announcements [Fleming and Remolona (1997, 1999), Balduzzi, Elton, and Green (2001), Green (2004)], or surrounding earnings announcements [Morse (1981), Bamber (1986), Ziebart (1990), and Kim and Verrecchia (1994)], raising the level of information asymmetry among market participants. Information asymmetry in this context can refer to the fact that agents in the market have differential information, or that informed investors have firm-specific, private information regarding certain announcements or events that is not shared by uninformed investors.[14] Consistent with this channel, Hegde and Paliwal (2005) find evidence of substantial increases in stock trading volume during the East Asian crisis. Using these variables, I test the following hypothesis:

(H2) Event periods are associated with higher levels of trading volume (actual amount transacted) and trading frequency (number of transactions) in the market.

C. Correlated Liquidity Shock Channel

The central point of the correlated liquidity shock channel is that subsequent to an initial shock, we should observe decreased liquidity in several markets, i.e. "drying up" of liquidity. For example, Kyle and Xiong (2001) present a model related to the above prediction to explain the events that unfolded after the Russian default in the summer of 1998 and the subsequent collapse of numerous prominent financial intermediaries such as LTCM. The intuition here is that a negative shock that decreases the wealth of rational agents might force them to reduce their positions thus lowering prices even further. The initial shock then amplifies to other fundamentally unrelated assets creating a financial liquidity crisis and contagion. Vayanos (2004) presents a related model that captures the flight to quality and liquidity during periods of uncertainty. Empirical evidence shows that liquidity premia seem to vary substantially over time and the variation depends strongly on the extent of uncertainty in the market [Amihud and Mendelson (1991), Kamara (1994), Longstaff (2004), De Jong and Driessen (2005)]. This model predicts that at times of uncertainty, risk premia as well as liquidity premia increase. Anecdotal evidence during the General Motors and Ford Motor Cos. woes supports the above view of a liquidity crisis that creates contagion. According to a *Wall Street Journal* quote on May 18, 2005: "Not only were certain hedge funds suddenly facing a liquidity crisis, but, according to rumors, so were their lenders." Furthermore, David Gilmore, partner at FX Analytics, Essex, Connecticut, mentions: "If youve got losses in a credit-derivatives portfolio and assets you cant liquidate, then you move down the chain and liquidate your next most-liquid assets."[15]

To empirically test the above channel, I construct various liquidity measures for the corporate bond market. As it is often noted, liquidity is an elusive concept that has various dimensions: tightness, depth, and resiliency. It is hard to define, let alone capture.[16] For this reason, it is imperative to examine different measures. Measures based on daily returns [Lesmond, Ogden, and Trzcinka (1999), Amihud (2002), Pastor and Stambaugh (2003), Bekaert, Harvey, and Lundblad (2007), Chen, Lesmond, and Wei (2007)], are difficult to construct in the corporate bond market from the transaction database that I am utilizing, given the lack of availability of high frequency trades. Due to the above limitations, the market-wide proxies of corporate bond liquidity that I am utilizing in this study are: (1) effective bid-ask spreads, (2) trading volume, (3) trading frequency, and (4) bond age.

Transaction costs (or bid-ask spreads) have been a very popular measure of liquidity. In this article, they are calculated using an approach similar to Hong and Warga (2000) and Chakravarty and Sarkar (2003). Higher bid-ask spreads is a sign of a less liquid market. Several researchers have used in the past this measure, both for the equity and debt market, as well as for asset-specific liquidity (or illiquidity) and market-wide liquidity [Amihud and Mendelson (1986, 1989), Sarig and Warga (1989), Chordia, Roll, and Subrahmanyam (2000, 2001), Hasbrouck and Seppi (2001), Chordia, Sarkar, and Subrahmanyam (2005), and Longstaff, Mithal, and Neis (2005) are some representative papers]. I also employ trading volume and frequency as proxies of liquidity (naturally, they are highly correlated), which are predicted to fall (in contrast to the information model). These are also traditional measures that have been used in the past in the liquidity literature [Brennan and Subrahmanyam (1996), Brennan, Chordia, and Subrahmanyam (1998), Elton and Green (1998), Chordia, Subrahmanyam, and Anshuman (2001), Delianedis and Geske (2001), Fleming (2003), and Piqueira (2004)].

Another proxy for market-wide liquidity that I employ is the mean bond age (market-wide average of the difference between the issue date and the trade date, in years). Bond age has been used in the literature as an individual-illiquidity proxy [Sarig and Warga (1989), Longstaff, Mithal, and Neis (2005), and Ericsson and Renault (2006)]. This variable is inversely related to the level of individual-bond liquidity. The intuition is that over time, the bonds enter into investors' portfolios, become inactive, and thus illiquid. However, if you take bond age as a market-wide measure of liquidity, this should be positively related to the level of market-wide liquidity. At times of poor liquidity, we would expect the mean bond age to drop since investors will be more inclined to hold younger (on-the-run) bonds which are considered more liquid.[17]

To test the above channel, I also utilize data on Treasury market liquidity. The measures that I am employing are quoted bid-ask spreads, on-the-run/off-the-run yield spreads, as well as price impact coefficients [See Fleming (2003) for a detailed discussion for the construction of these measures]. On-the-run/off-the-run spreads has been a traditional measure of liquidity in the Treasury market [Warga (1992), and Collin-Dufresne, Goldstein, and Martin (2001) are some representative papers that have utilized this measure]. Higher spreads is a sign of a less liquid market. Furthermore, Krishnamurthy (2002) has shown that the on-the-run/off-the-run spread on the 30-year Treasury bond is directly related to the spread between the three-month Commercial Paper/Treasury bill, a spread that most probably arises because of differences in liquidity. Then, price impact coefficients capture the extent to which a particular trade affects the price. In a liquid environment, you would expect minimal impact [Hasbrouck and Seppi (2001), and Sadka (2006) are some representative papers that have used this proxy].

Using all of the above variables, I test the following hypotheses:

(H3a) At a time of shock, the corporate bond market becomes less liquid (as approximated by higher effective bid-ask spreads, lower trading volume and frequency, and lower mean bond age).

(H3b) At a time of shock, the Treasury bond market becomes less liquid (as approximated by higher quoted bid-ask spreads, higher on-the-run/off-the-run yield spreads, and higher

price-impact coefficients).

III. Data Sources & Events

A. Data Sources

The primary database is a large panel data set from the Fixed Investment Securities Database (FISD) and the National Association of Insurance Commissioners (NAIC).[18] The FISD database consists of issue- and issuer-specific variables on all U.S. corporate bonds maturing in 1990 or later. The NAIC database consists of detailed information (such as issue and issuer cusip, trade date, dealer information, price, size of trade, type of institution, and type of transaction) on all transactions by life insurance companies, property and casualty insurance companies, and Health Maintenance Organizations (HMOs) from 1995 until 2003. An advantage of using this database compared to other sources of bond data, is the availability of actual transaction quotes rather than algorithmically determined 'matrix' prices.[19]

Insurance companies hold about 30% of all outstanding corporate bonds (according to the Flow of Funds published by the Federal Reserve). A natural question to ask here is whether the findings from this study can be generalized, since insurance companies hold a portion of the market. Furthermore, they are considered more conservative (or buy and hold) compared to other bond investors, such as hedge funds or pension funds. Chakravarty and Sarkar (2003) indirectly address this issue in their study of trading costs in several bond markets. They compare the trade size (daily volume) of Treasury bond transactions from insurance companies with transactions from GovPX, a database of Treasury bond transactions that includes most of the major interdealer brokers, to examine if there are significant differences. They find similar levels of trade size for comparable bonds for both data sets.

For every bond in the sample, I first calculate the yield to maturity. I then compute the corporate bond spread which is defined as the difference between the bond's yield to maturity and the interpolated yield to maturity of the benchmark U.S. Treasury. For the benchmark Treasuries, I use linear interpolation to obtain estimates of the yield curve from the Federal Reserve's Constant Maturity Treasury (CMT) daily series. After placing a number of restrictions on the type of bonds and eliminating suspicious transactions, I am left with 455, 167 observations. Appendix A has a detailed list of the procedure that I used. About 60% of these are buy transactions, and the rest are sells. In order to get a better sense of the number of observations as well as levels of yields and spreads, I group the bonds by year, credit rating, type of market (high-yield or investment-grade), industry (industrial, financial, and utility), and maturity.[20]

Table I indicates the number of transactions, issues, and issuers, by year, credit rating, industry, and maturity. Panel A shows that the bulk of the observations (54%) are between 2001-2003, while the number of traded issues and issuers peaks in 2001 and 2003, respectively. Across credit ratings, the bulk of the observations are on bonds with an A and BBB credit rating. 82% of the observations fall under the investment-grade market, and the rest under the high-yield market. Across industries, the bulk of the observations, issues, and issuers are in the industrial sector, while the utility sector has the least. Across maturity the bulk of the observations fall under the short- and medium-term. A very small percentage of the transactions, are on bonds with more than 30 years remaining to maturity.

Table I should be inserted around here

Table II shows the average corporate bond yields (in percentages) and spreads (in basis points), broken down by year, for all credit ratings as well as for all industry sectors. For the aggregate market, yields have been the highest in 2000 and the lowest in 2003. In terms of spreads, they peaked in 2002, while the lowest level was in 1997. In terms of industry sectors, industrials have the highest yields and spreads followed by the utility and financial sectors, respectively.

Table II should be inserted around here

A sample of data on Treasury market liquidity is also available, that was constructed using the GovPX database. This database captures all trades of Treasury securities (on-the-run and off-the-run) by three major interdealer brokers. Although it does not capture the whole of the primary-dealer market, it represents a significant portion of it. The sample on bid-ask spreads covers the period January 3, 1997, to September 27, 2002, for price impact coefficients from January 3, 1997, to April 28, 2000, and for on-the-run/off-the-run yield spreads from January 3, 1997, to December 29, 2000. The frequency of this data set is at the weekly level.

B. Events

The *Bankruptcy Datasource Index*, which is available from the Lexis-Nexis Academic Universe, together with the *Default Reports* from Moody's are used to obtain a list of defaults of U.S. companies between 1995-2003. The list of defaults includes Chapter 11 filings, missed interest payments and principals, as well as distressed exchanges.[21] Various sources such as the *Wall Street Journal*, *Business and Industry*, and *Bloomberg* are used to identify the exact default date. For Chapter 11 filings, the default date is defined in the following way: If there is a missed interest payment or principal prior to the filing date, then this is the default date. If not, then using sources such as the *Wall Street Journal* and *Business and Industry*, I look for articles stating that management is warning of a possible bankruptcy filing. For the events that I cannot identify the default in such a manner, I use the actual filing date. The above approach resembles partly that taken by Hertzel, Li, Officer, and Rodgers (2006) where they identify a *pre-filing* date, albeit in a different manner. In this way I am capturing an *unanticipated* event which naturally should have a stronger impact that the anticipated actual filing date.

I start with a total of 1,184 default events, and after merging with Compustat using the company name and ensuring that I have total assets information two years prior to default, I am left with 745 events. I then put a size restriction of at least two billion in total assets that leaves me with 63 events.[22] As a robustness check, I also utilize a total liability criterion of at least two billion as a measure of size. The number of events is slightly smaller.

The FISD database is used to obtain rating downgrades into 'junk' status. I start with a sample of 1,581 issuer downgrades (either by S&P or Moody's, whichever happens first in a given year). These downgrades could be one-notch or more. After merging with Compustat using both cusip and company name and ensuring that I have total assets information two years prior to the downgrade, I am left with 875 events. Using then a size restriction of at least ten billion in total assets, I am left with 50 events.[23] Again for robustness purposes, I use a total liabilities criterion of at least ten billion. The number of events is slightly smaller. A critical question that arises here is whether the main results of this paper hold with different size criterions. To address this issue, I rerun some of the tests with larger size restrictions (at least three billion and fifteen billion in total assets for default events and credit rating downgrades, respectively). These restrictions reduce the number of events to 101. The main results become stronger and more significant.

For the stock market downturn events, I observe the time-series returns of S&P 500 for the period of my analysis to identify the dates of the downturns. I define a stock market downturn as a day that the S&P 500 stock index loses 3% or more of its value. I then check the reason for the downturn using Lexis-Nexis. The use of 3% or more stock index loss ensures that my events capture the 1997 East Asian crisis, the Russian default of 1998 and the subsequent collapse of LTCM, the burst of the internet bubble of 2000, as well as all the accounting scandals of recent years. There were 23 stock market downturn events between January 1, 1995 and December 31, 2003.[24] Table III is a sample of all three type of events. It includes the ten largest defaults of my sample, based on the asset size two years prior to default. It also includes the ten largest downgrades (again based on the asset size two years prior to the downgrade), and the list of all 23 stock market downturns together with the cause of the downturn.

Table III should be inserted around here

Figure 1 provides a graphical representation of the frequency of events per year (broken down into credit rating downgrades, defaults, and stock market downturns). In total, the number of events is 136 (63 bankruptcies, 50 credit rating downgrades, and 23 stock market downturns). Not surprisingly, the graph indicates that most of the events occur in years 2001 and 2002, given the large number of defaults and downgrades in that period.

Figure 1 should be inserted around here

IV. Empirical Tests

A. Effects due to Economic Fundamentals

To examine this channel of propagation, I look at the effects on industry rivals following company-specific events. I first construct equally-weighted industry portfolios. Because high frequency data is not available in the bond market, I choose to utilize the Fama-French 48 industry sectors (instead of industries based on two-digit or four-digit sic code).[25] Firms in the portfolio satisfy the following characteristics: (1) They have the same Fama-French industry code as the "event" firm, and (2) they are available in the FISD-NAIC database.

The methodology that I utilize is an event-study approach, similar to Warga and Welch (1993) and Jorion and Zhang (2007). The measures that I am employing are CCY/S and CCAY/S. CCY/S refers to the cumulated change in raw yields/spreads between a pre- and post-event window, *the unadjusted measure*, whereas CCAY/S refers to the cumulated change in adjusted yields/spreads, *the risk-adjusted measure*. The adjustment here is calculated by subtracting from the raw yield/spread level the yield/spread of an equivalent benchmark index. Appendix B explains in detail the construction of the two measures. Unlike the usual event studies with stock data, I observe changes between small windows instead of daily changes. The pre-event window covers one-week period from days -7 to -2 prior to the event date, and the post-event window from days -1 to +4.

My original sample includes 113 events, where 63 are defaults and 50 are credit rating downgrades. Because of the documented clustering of defaults or similar occurrences that can dilute the impact of previous events, I only keep the first event in any industry and month. After merging the event file with the actual transaction file and matching issues between the pre- and post-event window, I am left with 76 events (41 defaults, and 35 credit rating downgrades) that cover 21 Fama-French industry sectors. The industry with the highest number of events is telecom, with 14 events, followed by utilities, with 12 events. Panel A of table IV reports the mean (in basis points), t-statistics, as well as the percentage of positive observations of the two measures using the event windows described above. As described in Appendix B, the analysis is conducted using two different approaches: first, bonds of the same company are aggregated to one bond/firm, and second, every bond is used as an independent observation. In all cases, the results are insignificant. Examining also the number of positive observations, on average, half of the events produce widening of the spreads of rival portfolios, whereas the rest result in narrowing of the spreads. A plausible reason for these results is because I did not adjust for the degree of competition in the industries. As Lang and Stulz (1992) point out, a bankruptcy or some form of distress announcement does not necessarily need to convey bad news for industry competitors. More concentrated industries can experience redistribution of wealth from the bankrupt firm to the rivals, *the competitive effect*, having a positive impact on competitors' bonds and narrowing their spreads. What might be occurring here is that the contagion and competitive effect could be canceling each other out. Adjusting for the degree of competition can potentially explain these results.

Table IV should be inserted around here

Based on the above observations, I calculate a Herfindahl index to capture the industry concentration.[26] Each year, industries are classified as "low" or "high" concentration using the median of this index for that year. Industries that have a value lower than the median are considered less concentrated, whereas the ones with a higher value are considered more concentrated. Panels B and C of table IV report the mean (in basis points) and relevant t-statistics of the two measures using both approaches (one bond/firm and all bonds). Out of the 76 events, 57 belong to an industry with a Herfindahl ratio below the median for the year prior to the event, while 19 are above. Again, in all cases the results are insignificant, suggesting that fundamentals might not be the driving force behind contagion.[27]

This finding supports the view suggested by numerous studies in equity markets, that contagion cannot be explained by economic fundamentals. Furthermore, the bond market is populated with sophisticated investors that can probably make better, and more informed decisions than equity investors. This is certainly the case with the database that I am utilizing which consists of transactions by only insurance companies. Then, market participants who feel that bonds of rival firms are actually underpriced and are trading at low prices, might actually be buying these bonds, raising their prices and lowering yields. If that's the case, then it is not surprising that there is no significant effect on the bonds of rival firms. Anecdotal evidence supports this scenario. For example, during the woes of the telecom industry in the first half of year 2002, Bill Gross, director at Pimco and probably the biggest player in the bond market, was buying billions of dollars of bonds of companies such as Sprint, AT&T Wireless, Deutsche Telecom, and France Telecom. At that point in time, Pimco owned $4 billion of Sprint's bonds (more than 17% of the company's outstanding debt) and $2 billion of AT&T's bonds (almost 6% of the company's debt).[28]

B. Information and Liquidity Hypotheses

B.1. Flight to Quality and Liquidity

One of the implications of contagion is the flight to quality and liquidity episodes. These episodes can be the outcome of information transmission, or liquidity shocks that increases the desire of investors to hold more liquid assets. For example, Collin-Dufresne, Goldstein and Helwege (2004), in their examination of firm-specific jump events of 200 basis points, find that there is a market-wide response following these occurrences and a movement of investors towards Treasury securities. Longstaff (2004) shows that at times of uncertainty there is a flight to liquidity. This is measured using the yield spread between the securities of Refcorp, a U.S. government agency, and Treasury securities. The additional yield on Refcorp issues is considered to be the reward of investors for holding these less liquid bonds.

To examine these episodes, Table V reports the changes in the yields/spreads of the corporate bond market and the Treasury yields of issues with different maturities (from the Constant Maturity Treasury (CMT) daily series) during trading weeks in which an event has occurred, and compare these results to changes during non-event weeks.[29] The choice of the weekly frequency arises due to limitations of daily or monthly frequency data. Weekly corporate market portfolios are constructed by first averaging the yields/spreads of every issuer for the trading week, and then equal-weighting all issuers.

Table V should be inserted around here

Looking at the results, there is evidence of an increase in the spreads of corporate bonds, and a decrease in the yield of Treasury securities, consistent with the information and liquidity hypotheses. Specifically, there is on average a 3bp increase in spreads during the event weeks, compared to a 1bp decrease during non-event weeks, for the investment-grade market. For the high-yield market, there is a 21bp increase in spreads during event periods, compared to a 4bp decrease during non-event periods. For the Treasury market, there is a significant larger drop in the yield of all issues during event periods compared to non-event periods. As expected, the most significant drop seems to be for short- or intermediate-term issues, rather than long-term. This is consistent with the idea that flight to quality and liquidity would be more prevalent on short- or intermediate-term Treasury securities (considered to be more liquid). Furthermore, from a total of 98 weeks, about two-thirds of them (depending on the maturity of the issue) result in flight to quality, evidenced by a downward movement of the Treasury yield.[30]

A closer look at specific important events (such as the East Asian crisis in October of 1987, the Russian default in August of 1998 and the subsequent collapse of LTCM, the September 11th terrorist attacks, and the WorldCom default) reveals a clear and very significant evidence of flight to quality and liquidity (results not reported for brevity). For example, the week after the September 11th terrorist attacks, the yield on the three-month and two-year Treasury issues dropped by 91 and 62 bp, respectively. Furthermore, the yield and the spread of the aggregate corporate bond market increased by 69 and 110 bp, respectively. During the WorldCom default (defined in my sample as the week that WorldCom admitted a $3.8 billion error in its accounting statements, about a month prior to the Chapter 11 filing date), the yield and the spread in the corporate bond market increased by 116 and 84 bp, respectively. If WorldCom is a firm-specific event, then why do we observe such a significant flight to quality episode during this period? This important question is addressed in the next section.

B.2. Information and Liquidity Proxies

As described above, the information and liquidity-shock channels can be used to explain the flight to quality and liquidity episodes. This section draws a distinction between the two channels using various proxies that capture the information transmission, as well as the liquidity in the markets.

Table VI presents summary statistics for various proxies that help to distinguish between the above channels. Panels A and B present the statistics for effective bid-ask spreads, and Panels C , D, and E present the statistics for trading volume, frequency, and bond age of the corporate bond market. Panels F, G, and H present the statistics for quoted bid-ask spreads, on-the-run/off-the-run spreads, and price impact coefficients of the Treasury market.

Table VI should be inserted around here

I calculate bid-ask spreads in the corporate bond market using the following approach: For a bond with at least one buy and one sell transaction within a given day, the effective bid-ask spread during that window is the dollar-value weighted difference between the buy and sell transactions, where the dealers are assumed to act as market makers. Similar to Chakravarty and Sarkar (2003), I eliminate unusually high traded spreads (exceeding $5 in absolute value). My sample consists of 5,527 bonds and 19,047 bond days (number of bonds times number of days each bond traded) for the aggregate market. The mean level of round-trip trading costs is 14 cents/$100 par for the aggregate market, 18 cents for the investment-grade market, and -13 cents for the high-yield market.[31] A reason for the negative mean level of bid-ask spreads in the high-yield market could be due to the small number of single-day matches. Furthermore, as Hong and Warga (2000) point out, negative bid-ask spreads can also arise because of inventory constraints, interest rate risk, and firm risk, faced by dealers and market participants. Then, the estimates of bid-ask spreads using trade data can also be biased due to nonsynchronous trading. Flow of information during the day can result in either an upward or downward bias of the bid-ask spreads. This is indicative by the high level of standard deviation. Furthermore, Schultz (2001) in a study of estimates of transaction costs, finds no evidence that lower rated bonds should have higher transaction costs.

I also estimate the effective spreads using a non-overlapping two-day window, in order to see how sensitive are my results to the one-day estimation window. In this procedure, I combine bid-ask spreads from a single-day window with bid-ask spreads of issues that can only be matched using a two-day window. My sample in this case increases to 5,809 bond issues and 28,145 bond days, for the aggregate bond market. The estimates are slightly higher, 17 cents for the aggregate market, 18 for the investment-grade, and -9 for the high-yield sector, consistent with the inclusion of less active bonds. These results, with the exception for the high-yield market, are comparable with previous findings (for both mean and median levels). Chakravarty and Sarkar (2003), using transaction data from insurance companies between 1995-1997, estimate the mean level of bid-ask spreads for corporate bonds to be 21 cents for a single-day window and 35 cents for a two-day window. Hong and Warga (2000) estimate an effective spread of 13 cents for investment-grade bonds, and 19 cents for high-yield bonds using a single-day window, same data and same time period. Schultz (2001) uses a different methodology that is based on a regression of the difference between the trade price and an estimated bid price on a dummy variable that takes a value of one for buys and zero for sells. He estimates round-trip trading costs to be 27 cents. One reason that he finds larger trading costs can be because of the fact that his methodology allows for a larger set of observations and examination of less active bonds.

In terms of trading volume and frequency, the mean daily level for the aggregate market is $609 million and 201 transactions, respectively. For the individual markets, the mean daily level is $550 million for volume and 165 for transactions for the investment-grade market, compared to 60 million and 37 transactions for the high-yield market. The significantly higher levels for the investment-grade market represents the fact that this is a larger sector. Furthermore, insurance companies tend to trade predominantly in investment-grade issues. For bond age, the average daily level is 2.60, 2.70, and 2.19 years, for the aggregate, investment-grade, and high-yield market, respectively. In terms of the Treasury market, the mean level of bid-ask spreads is 0.73 bp for the three-month bill, and 1.18 32nds of a point for the ten-year bond (where one point equals one percent of par).[32] As expected, the bid-ask spreads increase with the term of the issue. Regarding the on-the-run/off-the-run yield spreads, the mean level is 16.85 bp and 10.73 bp for the three-month bill and ten-year bond, respectively. In terms of price impact coefficients, the mean level is 0.15 bp and 0.19 32nds of a point for the three-month bill and ten-year bond, respectively.

Table VII reports differences in mean levels for the above measures between event and non-event weeks. Observing the bid-ask spreads, there seems to be no statistical difference between these periods. However, trading volume is significantly higher during event weeks.

Specifically, the average sum of trading volume (for the aggregate market) during event periods is \$3,980 million compared to \$2,660 million during non-event periods. The same pattern holds for trading frequency.[33] The average total level of transactions is 1,330 and 873 for event and non-event weeks, respectively. Surprisingly, investors seem to trade more on older bonds (off-the-run) during turbulence times. Specifically, the mean level for the aggregate market is 2.76 years, compared to 2.54 years during non-event weeks. These findings from the corporate bond market are contrary to the liquidity shock channel hypothesis, and more in favor of the information transmission hypothesis. Higher trading volume and frequency, as well as a higher level of bond age during event periods, indicate a more liquid market. The above observations are consistent with Calvo's (1999) model, where uninformed investors "mistakenly" infer that the sell-out of informed investors from risky securities (due to margin calls) might be a signal of low returns. Thus they move out from risky securities increasing the volume and frequency of transactions in the process, and eventually creating a crisis and contagion.

Table VII should be inserted around here

Examining the findings on trading volume and frequency more closely, one possible reason for the differences is the time effect. Specifically, there has been a much higher level of these measures in recent years (2001-2003), compared to the rest of the period (1995-2000). Since most of the events that I am examining occur in recent years, then it is likely that the actual time period of the event weeks is the reason for these differences, and not the existence of the event. In order to check for this possible bias, I estimate the nonlinear trend for the weekly time series observations, and I reexamine differences between event and non-event weeks using the de-trended observations. The results (not reported here for brevity) are robust to the time effect with still significant higher levels, albeit smaller, of the above measures during event weeks.

Panels F, G, and H show differences in the levels of bid-ask spreads, on-the-run/off-the-run spreads, as well as price impact coefficients for the Treasury market. In terms of bid-ask spreads, I observe significant differences between event and non-event weeks, with the spreads being for most issues higher during the event periods. Specifically, for the three-month bill bid-ask spreads are, on average, 0.84 bp during event weeks compared to 0.69 bp during non-event weeks. Competition between the dealers and gain or loss of their market power can help to explain the significant changes in the bid-ask spreads in the Treasury market, unlike the corporate bond market. The Treasury market is in general a liquid market and when an event occurs and investors move to the safety of Treasury securities, dealers have the ability to raise bid-ask spreads as a reward for providing these assets. On the contrary, the corporate bond market is in general a less liquid market and the dealers have a lot of market power. However, when an event occurs that initiates more trading, they can lose some of their market power and cannot raise bid-ask spreads as much as they would like to. In terms of on-the-run/off-the-run spreads, there are statistically significant differences between event and non-event weeks, although the results are somewhat mixed. For example, for the three-month and six-month bill, the spreads are lower during event weeks compared to non-event weeks, suggesting that liquidity is higher during the event periods. However, for the ten-year bond the opposite occurs, i.e. the spreads are lower during the non-event weeks. The same mixed pattern can be observed for the price impact coefficients. For the short-term bills (six-month and one-year) the coefficients are lower during the event weeks, whereas the opposite occurs for the long-term issues. The above results however are consistent with the impact of the flight to liquidity. As more investors leave the corporate bond market they look for the safe haven provided by the short-term, and substantially more liquid instruments of the Treasury market.[34]

V. Conclusions

This study contributes to our understanding of financial market spillovers and contagion by bringing a new set of data and examining the implications of previously proposed channels of contagion. These theories predict that an economic shock can be spread because of economic fundamentals linking assets or markets, information transmission, or due to liquidity shocks. Using a sample of major defaults, credit rating downgrades into 'junk' status, and stocks market downturns, I examine the propagation of these events within the Treasury and corporate bond market between 1995-2003.

My main findings are as follows: The effects of company-specific shocks on industry rivals are not significant, suggesting that contagion might not be due to economic fundamentals. This might not be that surprising given the fact that the empirical contagion literature has found significant excess correlation between assets or markets, even after controlling for economic fundamentals. However, I do observe episodes of flight to quality during the event periods, indicated by a fall in the Treasury yields and widening of the corporate bond spreads. The flight to quality is supported by the information transmission and liquidity-shock channels of contagion, that induces investors to move away from risky assets to the safe haven of the Treasury market. Distinguishing then between these channels of contagion, I actually find that the level of trading in the corporate bond market is higher during these flight to quality episodes. A higher level of trading is contrary to the popular belief that liquidity "dries up", which has so often been associated with turbulence times. The above results are consistent with Calvo's (1999) model where the selling of risky securities by informed investors can be "mistakenly" taken as a sign of low returns by uninformed traders. The end result is a movement out of the risky issues by most investors that drives prices down even further, increases trading, and creates contagion. Overall, the findings are more supportive of the information channel as a means of inducing contagion, rather than the economic fundamental story or the correlated liquidity shock channel.

In this article, I focused my attention on the response to financial shocks in terms of pricing and liquidity, from the bond market (corporate and Treasury). An important avenue for future research is an examination of the response of the equity market as well, to these credit or market-wide events. Furthermore, an extension to my work could also include the examination of the liquidity level (and how this varies) at the industry-level, not only at the market-level. Also, one could distinguish between the three types of shocks that I am investigating. In any case, I believe that the results from this study shed more light to the ongoing debate of what is the dominant reason for the financial market spillovers and contagion that we have unfortunately experienced in recent years. This can prove useful not just to academics, but to both practitioners as well as regulators.

Appendix A. Screens used for cleaning the NAIC Database

I first impose the following restrictions on the type of bonds: (1) I include corporate debentures, corporate issues backed by letter-of-credit, corporate medium-term notes, corporate medium-term notes zero, corporate zeros, and corporate insured debentures, (2) I include only fixed-rate bonds, with a credit rating, from U.S. issuers, with semi-annual coupons (2) the industry groups include the industrial, financial, and utility sectors, (3) I exclude bonds that are puttable, convertible, perpetual, exchangeable, and have announced calls, and (4) I exclude asset-backed issues, credit enhancements, yankees, canadian, issues denominated in foreign-currency, as well as issues offered globally. These screens reduce the sample to $506,406$ transactions. I then eliminate transactions in which the dealer description has the following label: maturity, direct, transfer, exchange of securities, transferred from michigan, called, tender, redemption, merger, tax free exchange, issuer, conversion, exchanged, matured, put, redeemed, sinking fund, no broker, tender offer.

This process eliminates $21,533$ observations, leaving $484,873$ transactions. I then compress the dealer description label to capture suspicious data that are not removed by the above process. I use the following compressed names: sinking, sink, exchange, tender, securitycalled, intercompany, internal, transfer, taxable, redemption, partial, voluntary, principalpay, principalred, special, installment, original, scheduled, issue, sinkpmt, direct, fullcall, restructured, inexchange, issuing, purchase/ten, bondtender, bondcalled, interestrec, bondmove, redeem, principalpr, tsfr, affiliated, reversal, reinsurance.

This action eliminates another 22,491 observations, leaving a sample of 462,382 transactions. I then eliminate observations that fall under non-trading days (weekends or holidays). I also eliminate the observations on December 31 for years 1996, 1997, 1998 as too many observations were recorded on these dates (they were probably transacted on different dates). This process eliminates 7,215 transactions and leaves me with a sample of 455,167 observations.

Appendix B. Construction of CCY/S and CCAY/S

In the spirit of the methodologies used by Warga and Welch (1993) and Jorion and Zhang (2007), I employ CCY/S and CCAY/S as the two measures to examine changes in the level of the yields/spreads. CCY/S refers to the cumulated change in raw yields/spreads, whereas CCAY/S refers to the cumulated change in adjusted yields/spreads. The second measure is constructed by subtracting from the raw bond yields/spreads, the yield/spread of an index with similar rating and maturity characteristics as the bond of interest. Specifically, I construct 15 equal-weighted adjustment indexes in the dimensions of risk and maturity using the FISD-NAIC database. These indexes do not include the event or rival firms. The rating categories are AAA, AA, A, BBB, and Below BBB (junk). Each rating category is then subdivided into a short-term (1 to 7 years left to maturity), intermediate (7 to 15 years), and long-term category (15 years onwards).

Thus the rating-adjusted spread for issue j at time t (AS_{jt}) is given by:

$$AS_{jt} = S_{jt} - I_{rt} \tag{1}$$

where S_{jt} is the spread of issue j at time t, and I_{rt} is the spread of the adjustment index r at time t.

The change in adjusted spread during the event window is given by:

$$CAS_j(t_1, t_2) = AS_{jt_2} - AS_{jt_1} \tag{2}$$

My analysis then proceeds in two ways; I first average this measure within a firm (one bond/firm), and then across all firms in order to get CCAY/S. I then calculate the cross-sectional mean of the full sample as well as t-statistics. I also calculate CCAY/S assuming that different bonds of a company are considered to be independent observations (all bonds).[35]

REFERENCES

Amihud, Yakov, 2002, Illiquidity and stock returns: Cross-section and time-series effects, *Journal of Financial Markets* 5, 31-56.

Amihud, Yakov, and Haim Mendelson, 1986, Liquidity, maturity, and the yield on U.S. Treasury securities, *Journal of Financial Economics* 17, 223-249.

Amihud, Yakov, and Haim Mendelson, 1989, The effects of beta, bid-ask spread, residual risk and size on stock returns, *Journal of Finance* 44, 479-486.

Amihud, Yakov, and Haim Mendelson, 1991, Liquidity, maturity, and the yield on U.S. Treasury securities, *Journal of Finance* 46, 479-486.

Bae, Kee-Hong, Andrew Karolyi, and Rene M. Stulz, 2003, A new approach to measuring financial contagion, *Review of Financial Studies* 16, 717-763.

Balduzzi, Pierluigi, Edwin J. Elton, and T. Clifton Green, 2001, Economic news and bond prices: Evidence from the U.S. Treasury market, *Journal of Financial and Quantitative Analysis* 36, 523-543.

Ball, Clifford A., and Walter N. Torous, 2006, Contagion in the Presence of Stochastic Interdependence, Working Paper.

Bamber, Linda S., 1986, The information content of annual earnings releases: A trading volume approach, *Journal of Accounting Research* 24, 40-56.

Bank of International Settlements, 1999a, A review of financial market events in autumn 1998, Basel, Switzerland.

Bank of International Settlements, 1999b, Market liquidity: Research findings and selected policy implications, Basel, Switzerland.

Bank of International Settlements, 1999c, How should we design deep and liquid markets? The case of government securities, Basel, Switzerland.

Barberis, Nicholas, and Andrei Shleifer, 2003, Style investing, *Journal of Financial Economics* 68, 161-199.

Barberis, Nicholas, Andrei Shleifer, and Jeffrey Wurgler, 2005, Comovement, *Journal of Financial Economics* 75, 283-317.

Barlevy, Gadi, and Pietro Veronesi, 2003, Rational panics and stock market crashes, *Journal of Economic Theory* 110, 234-263.

Beaver, W.H., 1968, The information content of annual earnings announcements, *Empirical Research in Accounting: Selected Studies*, supplement to *The Journal of Accounting Research*, 67-92.

Bekaert, Geert, Campbell R. Harvey, and Christian Lundblad, 2007, Liquidity and expected returns: Lessons from emerging markets, *forthcoming Review of Financial Studies*.

Bekaert, Geert, Campbell R. Harvey, and Angela Ng, 2005, Market integration and contagion, *Journal of Business* 78, 39-70.

Bessembinder, Hendrik, William Maxwell, and Kumar Venkataraman, 2006, Market transparency, liquidity externalities, and institutional trading costs in corporate bonds, *Journal of Financial Economics* 82, 251-288.

Brennan, Michael J., and Avanidhar Subrahmanyam, 1996, Market microstructure and asset pricing: On the compensation for illiquidity in stock returns, *Journal of Financial Economics* 41, 441-464.

Brennan, Michael J., Tarun Chordia, and Avanidhar Subrahmanyam, 1998, Alternative factor specifications, security characteristics, and the cross-section of expected stock returns, *Journal of Financial Economics* 49, 345-373.

Cai, Nianyun, Jean Helwege, and Arthur Warga, 2005, Underpricing and reputation acquisition in the corporate bond market, Working Paper.

Calvo, Guillermo, 1999, Contagion in emerging markets: When *Wall Street* is a carrier, Working Paper, University of Maryland.

Campbell, John Y., and Glen B. Taksler, 2003, Equity volatility and corporate bond yields, *Journal of Finance* 58, 2321-2349.

Chae, Joon, 2005, Trading volume, information asymmetry, and timing information, *Journal of Finance* 60, 413-442.

Chakravarty, Sugato, and Asani Sarkar, 2003, Trading costs in three U.S. bond markets, *Journal of Fixed Income* 13, 39-48.

Chen, Long, David A. Lesmond, and Jason Wei, 2007, Corporate yield spreads and bond liquidity, *Journal of Finance* 62, 119-149.

Chordia, Tarun, Richard Roll, and Avanidhar Subrahmanyam, 2000, Commonality in liquidity, *Journal of Financial Economics* 56, 3-28.

Chordia, Tarun, Richard Roll, and Avanidhar Subrahmanyam, 2001, Market liquidity and trading activity, *Journal of Finance* 56, 501-530.

Chordia, Tarun, Asani Sarkar, and Avanidhar Subrahmanyam, 2005, An empirical analysis of stock and bond market liquidity, *Review of Financial Studies* 18, 85-129.

Chordia, Tarun, Avanidhar Subrahmanyam, and V.Ravi Anshuman, 2001, Trading activity and expected stock returns, *Journal of Financial Economics* 59, 3-32.

Collin-Dufresne, Pierre, Robert S. Goldstein, and Jean Helwege, 2004, Is credit event risk priced? modeling contagion via the updating of beliefs, Working Paper.

Collin-Dufresne, Pierre, Robert S. Goldstein, and J. Spencer Martin, 2001, The determinants of credit spread changes, *Journal of Finance* 56, 2177-2208.

Connolly, Robert A., and F. Albert Wang, 2003, International equity market comovements: Economic fundamentals or contagion?, *Pacific-Basin Finance Journal* 11, 23-43.

Connolly, Robert A., Chris Stivers, and Licheng Sun, 2004, Stock market uncertainty and the stock-bond return relation, *Journal of Financial and Quantitative Analysis* 40, 161-194.

Das, Sanjiv R., 2003, Contagion, *Journal of Investment Management* 1(3), 78-84.

De Jong, Frank, and Joost Driessen, 2005, Liquidity risk premia in corporate bond markets, Working Paper, University of Amsterdam.

Delianedis, Gordon, and Robert Geske, 2001, The components of corporate credit spreads: Default, recovery, tax, jumps, liquidity, and market factors, Working Paper, UCLA.

Dimson, Elroy, and Stefan Nagel, 2002, Seeking Out Investment Value in Styles, in *Mastering Investment*, FT Pitman Publishing, 2002, and *Financial Times*, March 2001.

Dungey, Mardi, Renee Fry, Brenda Gonzalez-Hermosillo, and Vance L. Martin, 2002, Contagion in International Bond Markets During the Russian and LTCM crises, *forthcoming Journal of Financial Stability.*

Eichengreen, Barry, Galina Hale, and Ashoka Mody, 2001, Flight to quality: Investor risk tolerance and the spread of emerging market crises, in Stijn Claessens, and Kristin J. Forbes, eds: *International Financial Contagion.*

Elton, Edwin J., and T. Clifton Green, 1998, Tax and liquidity effects in pricing government bonds, *Journal of Finance* 53, 1533-1562.

Ericsson, Jan, and Olivier Renault, 2006, Liquidity and credit risk, *Journal of Finance*, 61, 2219-2250.

Fleming, Michael J., 2003, Measuring treasury market liquidity, *Federal Reserve Bank of New York Economic Policy Review* 9(3), 83-108.

Fleming, Michael J., and Eli M. Remolona, 1997, What moves the bond market?, *Federal Reserve Bank of New York Economic Policy Review*, December, 31-50.

Fleming, Michael J., and Eli M. Remolona, 1999, Price formation and liquidity in the U.S. Treasury market: The response to public information, *Journal of Finance* 54, 1901-1915.

Forbes, Kristin J. and Roberto Rigobon, 2001, Measuring contagion: Conceptual and empirical issues, in Stijn Claessens, and Kristin J. Forbes, eds: *International Financial Contagion.*

Forbes, Kristin J., and Roberto Rigobon, 2002, No contagion, only interdependence: Measuring stock market comovements, *Journal of Finance* 57, 2223-2261.

Gande, Amar, and David C. Parsley, 2005, New spillovers in the sovereign debt market, *Journal of Financial Economics* 75, 691-734.

Gennotte, Gerard, and Hayne Leland, 1990, Market liquidity, hedging, and crashes, *American Economic Review* 80, 999-1021.

Green, T. Clifton, 2004, Economic news and the impact of trading on bond prices, *Journal of Finance* 59, 1201-1233.

Gulko, Les, 2002, Decoupling, *Journal of Portfolio Management* 28(3), 59-66.

Hamao, Yasushi, Ronald Masulis, and Victor Ng, 1990, Correlations in price changes and volatility across international stock markets, *Review of Financial Studies* 3, 281-308.

Halstead, John M., Shantaram Hegde, and Linda S. Klein, 2004, Orange county bankruptcy: Financial contagion in the municipal bond and bank equity markets, *The Financial Review* 39, 293-315.

Hasbrouck, Joel, and Duane J. Seppi, 2001, Common factors in prices, order flows and liquidity, *Journal of Financial Economics* 59, 383-411.

Hertzel, Michael G., Zhi Li, Micah S. Officer, and Kimberly J. Rodgers, 2006, Inter-firm linkages and the wealth effect of financial distress along the supply chain, *forthcoming Journal of Financial Economics.*

He, Hua and Jiang Wang, 1995, Differential information and dynamic behavior of stock trading volume, *Review of Financial Studies* 8, 919-972.

Hegde, Shantaram P., and Rupendra Paliwal, 2005, Financial contagion and market liquidity: Evidence from the Asian crisis, Working Paper.

Hong, Harrison, and Jeremy C. Stein, 2003, Differences of opinion, short-sales constraints, and market crashes, *Review of Financial Studies* 16, 487-525.

Hong, Gwangheon, and Arthur Warga, 2000, An empirical study of bond market transactions, *Financial Analysts Journal* 56, 32-46.

Jain, Prem C., 1988, Response of hourly stock prices and trading volume to economic news, *Journal of Business* 61, 219-231.

Jarrow, Robert A., and Fan Yu, 2001, Counterparty risk and the pricing of defaultable securities, *Journal of Finance* 56, 1765-1799.

Jones, Charles M., Gautam Kaul, and Marc L. Lipson, 1994a, Transactions, Volume, and Volatility, *Review of Financial Studies* 7, 631-651.

Jones, Charles M., Gautam Kaul, and Marc L. Lipson, 1994b, Information, trading, and volatility, *Journal of Financial Economics* 36, 127-154.

Jorion, Philippe, and Zhang, Gaiyan, 2007, Good and Bad Credit Contagion: Evidence from Credit Default Swaps, *Journal of Financial Economics* 84(3), 860-883.

Kallberg, Jarl, and Paolo Pasquariello, 2007, Time-series and cross-sectional excess comovement in stock indexes, *forthcoming Journal of Empirical Finance.*

Kamara, Avraham, 1994, Liquidity, taxes, and short-term Treasury yields, *Journal of Financial and Quantitative Analysis* 29, 403-417.

Kim, Oliver, and Robert E. Verrecchia, 1994, Market liquidity and volume around earnings announcements, *Journal of Accounting and Economics* 17, 41-67.

Kim, Oliver, and Robert E. Verrecchia, 1997, Pre-announcement and event-period information, *Journal of Accounting and Economics* 24, 395-419.

King, Mervyn A., and Sushil Wadhwani, 1990, Transmission of volatility between stock markets, *Review of Financial Studies* 3, 5-33.

Kodres, Laura E., and Matthew Pritsker, 2002, A rational expectations model of financial contagion, *Journal of Finance* 57, 769-799.

Krishnamurthy, Arvind, 2002, The bond/old bond spread, *Journal of Financial Economics* 66, 463-506.

Krishnan, C.N.V., Peter H. Ritchken, and James B. Thomson, 2005, Monitoring and controlling bank risk, *Journal of Finance* 60, 343-378.

Kyle, Albert S., and Wei Xiong, 2001, Contagion as a wealth effect, *Journal of Finance* 56, 1401-1440.

Lang, Larry H.P., and Rene M. Stulz, 1992, Contagion and competitive intra-industry effects of bankruptcy announcements, *Journal of Financial Economics* 32, 45-60.

Lesmond, David A., Joseph P. Ogden, and Charles Trzcinka, 1999, A new estimate of transaction costs, *Review of Financial Studies* 12, 1113-1141.

Lin, Wen-Ling, Robert F. Engle, and Takatoshi Ito, 1994, Do bulls and bears move across borders? International transmission of stock returns and volatility, *Review of Financial Studies* 7, 507-538.

Longstaff, Francis A., 2004, The flight-to-liquidity premium in U.S. Treasury bond prices, *Journal of Business* 77, 511-526.

Longstaff, Francis A., Sanjay Mithal, and Eric Neis, 2005, Counterparty yield spreads: Default risk or liquidity? new evidence from the credit default swap market, *Journal of Finance* 60, 2213-2253.

Masson, Paul R., 1998, Contagion: Monsoonal effects, spillovers, and jumps between multiple equilibria, IMF Working Paper, No. 98/142.

Milgrom, Paul, and Nancy Stokey, 1982, Information, trade, and common knowledge, *Journal of Economic Theory* 26, 17-27.

Morse, Dale, 1981, Price and trading volume reaction surrounding earnings announcements: A closer examination, *Journal of Accounting Research* 19, 374-383.

Pasquariello, Paolo, 2007, Imperfect competition, information heterogeneity, and financial contagion, *Review of Financial Studies* 20, 391-426.

Pastor, Lubos, and Robert F. Stambaugh, 2003, Liquidity risk and expected stock returns, *Journal of Political Economy* 111, 642-685.

Phylaktis, Kate, and Lichuan Xia, 2005, Equity market comovement and contagion: A sectoral perspective, Emerging Markets Group, Cass Business School, City University, Working Paper.

Piqueira, Natalia S., 2004, Stock returns, illiquidity cost and excessive trading activity, Working Paper, University of Houston.

Romer, David, 1993, Rational asset-price movements without news, *American Economic Review* 83, 1112-1130.

Sadka, Ronnie, 2006, Momentum and post-earnings-announcement drift anomalies: The role of liquidity risk, *Journal of Financial Economics* 80, 309-349.

Sangvinatsos, Antonios A., 2002, Crises and Contagion, Working Paper, University of Southern California.

Sarig, Oded, and Arthur Warga, 1989, Bond price and bond market liquidity, *Journal of Financial and Quantitative Analysis* 24, 367-378.

Schultz, Paul, 2001, Corporate bond trading costs: A peek behind the curtain, *Journal of Finance* 66, 677-698.

Scruggs, John T., and Paskalis Glabadanidis, 2003, Risk premia and the dynamic covariance between stock and bond returns, *Journal of Financial and Quantitative Analysis* 38, 295-316.

Tirole, John, 1982, On the possibility of speculation under rational expectations, *Econometrica* 50, 1163-1181.

Underwood, Shane, 2004, The cross-market information content of stock and bond order flow, Working Paper, Rice University.

Vayanos, Dimitri, 2004, Flight to quality, flight to liquidity, and the pricing of risk, Working Paper, London School of Economics.

Warga, Arthur, and Ivo Welch, 1993, Bondholder losses in leveraged buyouts, *Review of Financial Studies* 6, 959-982.

Yuan, Kathy, 2005, Asymmetric price movements and borrowing constraints: A rational expectations equilibrium model of crisis, contagion, and confusion, *Journal of Finance* 60, 379-411.

Ziebart, David A., 1990, The association between consensus of beliefs and trading activity surrounding earnings announcements, *The Accounting Review* 65, 477-488.

Notes

[1]Other major international financial shocks include the exchange rate mechanisms attacks in Europe in 1992-1993, the depreciation of the Brazilian currency in 1999, as well as the default of Argentina in 2001.

[2]For more details, see the reports by the Bank of International Settlements (1999a,b,c).

[3]Default & recovery rates of corporate bond issuers: 1920 - 2003, Moody's Investors Service, February 2003.

[4]The percentage of fallen angels was at 5.2% in 2002, up from just over 2% in 2001.

[5]Senior vice-president at Pimco, a California fund group, The Wall Street Journal, Thursday, March 17, 2005.

[6]Chief bond-market strategist at Miller Tabak & Co., The Wall Street Journal, Thursday, March 17, 2005.

[7]Although it is difficult to list here the extensive empirical body of work on equity market contagion, see Hamao, Masulis, and Ng (1990), King and Wadhwani (1990), Lin, Engle, and Ito (1994), Forbes and Rigobon (2001, 2002), Bae, Karolyi, and Stulz (2003), Connolly and Wang (2003), Bekaert, Harvey, and Ng (2005), Hegde and Paliwal (2005), Phylaktis and Xia (2005), Ball and Torous (2006), and Kallberg and Pasquariello (2007) for some related papers. See Sangvinatsos (2002) and Das (2003) for short surveys on contagion.

[8]There is no consensus in the literature for the exact definition of contagion. The definition that is used in this paper is the propagation of a financial shock from one asset or market to other assets or markets. For more details, see the World Bank website (under the Macroeconomics and Growth Research Program) that includes alternate definitions as well as other relevant information.

[9]Exceptions are papers by Hegde and Paliwal (2005), and Kallberg and Pasquariello (2007). The first study examines the interaction of financial contagion and market liquidity during the Asian crisis, while the second examines the excess comovement of industry indexes in the U.S. stock market.

[10]Although not part of the existing theoretical contagion literature, Barberis and Shleifer (2003) develop a model of "style investing" that can generate contagious effects. This refers to a pattern of investment where investors group assets into categories and then distribute funds among these categories rather than among individual securities. A negative asset-specific shock into one of the styles, will induce investors to withdraw money from that style, and invest in some other style, creating contagion. Dimson and Nagel (2002) and Barberis, Shleifer, and Wurgler (2005) offer empirical support of the existence of this trading behavior. Masson (1998) offers also another potential explanation of contagion based on irrational herding behavior.

[11]To my knowledge, there are only a few papers that looked at contagion within the bond market. Eichengreen, Hale, and Mody (2001) examine how the financial crises of the 1990s affected the price, volume, and maturity of bonds issued by emerging market governments. Dungey, Fry, Gonzalez-Hermosillo, and Martin (2002) examine the contagion effect on bond prices of 12 countries during the Russian financial crisis of 1998. Collin-Dufresne, Goldstein, and Helwege (2004) develop and test an information-based model to capture contagion within the U.S. bond market. Halstead, Hegde, and Klein (2004) examine the spillover effects from the Orange County bankruptcy. Gande and Parsley (2005) investigate the spillover effects of a sovereign credit rating change of one country on the sovereign credit spreads of other countries.

[12]See Gulko (2002), Scruggs and Glabadanidis (2003), Collin-Dufresne, Goldstein, and Helwege (2004), Connolly, Stivers, and Sun (2004), Longstaff (2004), Underwood (2004), and Vayanos (2004) for some related papers on flight to quality and liquidity.

[13]At the other end of the spectrum, there is the no-trade theorem [Milgrom and Stockey (1982), Tirole (1982)] The usual avenue that models use to circumvent this issue is by the introduction of irrational, noisy traders in addition to the rational agents.

[14]See Jain (1988), Jones, Kaul, and Lipson (1994a, 1994b), and Chae (2005) for some other related papers on trading volume.

[15]The Wall Street Journal, May 18, 2005.

[16]A traditional way that has been used to describe liquidity is the ability to trade large quantities fairly quickly, with low transaction costs, and without making a great impact on the market price.

[17]Chakravarty and Sarkar (2003), in their study of trading costs in the Treasury, municipal, and corporate bond markets, show that the mean bond age is highest in the Treasury market. This is an indication that investors are more willing to hold or trade off-the-run bonds in the Treasury market (compared to the municipal or corporate bond markets), since this is the most liquid of the three.

[18]This is the same database that was used by Campbell and Taksler (2003), Cai, Helwege, and Warga (2005), Krishnan, Ritchken, and Thomson (2005), and Bessembinder, Maxwell, and Venkataraman (2006).

[19]In July 1, 2002, the National Association of Securities Dealers (NASD) began a program known as the Trade Reporting and Compliance Engine (TRACE) system, in an effort to increase transparency in the corporate bond market. NASD members are required to report the relevant information on all secondary market transactions, within a relatively short period of time (currently at 15 minutes). This system now includes the complete corporate bond market. The main reason however that I cannot use this database for my study is the fact that it does not include historical information, and my aim is to capture specific financial shocks that happened in the late 1990s' and early 2000s'.

[20]FISD provides credit ratings by four agencies (S&P, Moody's, Fitch, and Duff and Phelps). I use the

S&P ratings.

[21]Lexis-Nexis includes all the bankruptcies of U.S. firms with more than 50 million in assets. Moody's Default Reports contains all the defaults among Moody's-rated long-term debt issuers.

[22]I focus on large bankruptcies since I want to capture events that can have an industry- and market-wide effect. For the same reasons, Lang and Stulz (1992) focus on bankrupt firms with liabilities in excess of 120 million. Furthermore, Collin-Dufresne, Golstein, and Helwege (2004) and Jorion and Zhang (2007) show that credit events due to larger firms have more profound effects either within the industry or to the whole market.

[23]The FISD database also contains information on dates when issues are placed on negative watch. This date would have been preferable to the actual downgrade date. However, for my final sample of 50 events I did not have such a date, possibly because rating agencies are sometimes too slow to place a firm on negative watch and are thus forced to downgrade the firm (without prior placement on negative watch).

[24]A use of 2% or more stock index loss implies 97 events, a number that can dilute the impact of the major events that I am trying to capture. On the other hand, a use of 4% or more stock index loss implies only six events that misses some of the important shocks.

[25]The information for these industry sectors can be obtained from Ken French's website, at *http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html*.

[26]I construct this index for each year using all 48 Fama-French industries. I use net sales from Compustat annual tapes.

[27]The same procedure is done using the lowest quartile to divide the industries into the two subgroups. The results are similar.

[28]"Why the bond king loves the unloved", The Wall Street Journal, May 31, 2002.

[29]The information on the CMT series can be obtained from the Federal Reserve Statistical Release's website, at *http://www.federalreserve.gov/releases/h15/data.htm*.

[30]I acknowledge the fact that the movement in yields (spreads) is a proxy for flight to quality and liquidity trades. Unfortunately, I do not have information on the actual transactions from the Treasury market.

[31]I also calculate bid-ask spreads by dividing the actual spread with the midpoint of the buy-sell price. Using this method, the bid-ask spreads of the investment-grade and high-yield market are closer in line to each other. This is because investment-grade bonds are trading much closer to par than high-yield issues.

[32]The denominations here are consistent with market quoting standards.

[33]Trading volume and frequency are two measures that are highly correlated.

[34]In any case, an issue surrounding the Treasury liquidity results is the fact that the data available do not cover the whole time period from 1995-2003.

[35]CCY/S is calculated in the same fashion, but without any adjustment.

Table I
Number of Transactions, Issues, and Issuers

I include corporate bonds with a fixed rate, credit rating, from U.S. issuers, with semi-annual coupons, nonputtable, and nonconvertible. I exclude asset-backed securities, credit enhancements, yankees, Canadian, bonds in foreign currencies, issues offered globally, bonds with announced calls, perpetual, exchangeable, and preferred securities. The industry groups include the industrial, financial, and utility sectors.

Panel A: No. of transactions by year			Panel B: No. of issues by year		Panel C: No. of issuers by year	
	N	**%**	**N**		**N**	
1995-2003	455,167	100.0	8,409		2,431	
1995	22,741	5.0	2,521		957	
1996	27,089	6.0	3,051		1,136	
1997	29,520	6.5	3,592		1,292	
1998	43,105	9.5	4,184		1,410	
1999	45,805	10.1	4,591		1,510	
2000	40,455	8.9	4,407		1,489	
2001	75,713	16.6	4,795		1,607	
2002	85,895	18.9	4,500		1,579	
2003	84,844	18.6	4,459		1,651	
Panel D: No. of transactions by rating			**Panel E: No. of issues by rating**		**Panel F: No. of issuers by rating**	
	N	**%**	**N**		**N**	
AAA	6,471	1.4	209		57	
AA	38,719	8.5	1,277		271	
A	166,348	36.5	4,003		833	
BBB	161,239	35.4	3,519		998	
Total Inv-Gr.	372,777	81.9	6,937		1,571	
Below BBB (High-Yield)	82,390	18.1	2,218		1,155	
Panel G: No. of transactions by industry			**Panel H: No. of issues by industry**		**Panel I: No. of issuers by industry**	
	N	**%**	**N**	**%**	**N**	**%**
Industrial	276,631	60.8	4,398	52.3	1,547	63.6
Financial	119,113	26.2	2,544	30.3	570	23.4
Utility	66,638	14.6	1,472	17.5	315	13.0
Panel J: No. of transactions by maturity			**Panel K: No. of issues by maturity**		**Panel L: No. of issuers by maturity**	
	N	**%**	**N**		**N**	
Short (1-7 yrs)	196,358	43.1	5,245		1,860	
Medium (7-15 yrs)	185,358	40.7	4,654		2,048	
Long (15 yrs-30 yrs)	64,675	14.2	1,537		653	
V. Long (30 yrs-onwards)	8,776	1.9	420		51	

Table II
Average Corporate Bond Yields and Spreads

Using panel data between 1995 to 2003, I report corporate bond yields (in percentages) and spreads (in basis points). For the benchmark Treasuries, I use linear interpolation to obtain estimates of the yield curve from the Federal Reserve's Constant Maturity Treasury (CMT) series. I include bonds with a fixed rate, credit rating, from U.S. issuers, with semi-annual coupons, nonputtable, and nonconvertible. I exclude asset-backed securities, credit enhancements, yankees, Canadian, bonds in foreign currencies, issues offered globally, bonds with announced calls, perpetual, exchangeable, and preferred securities. The industry groups include the industrial, financial, and utility sectors.

	AAA	AA	A	BBB	Total Inv-Gr.	Below BBB (High Yield)	Total Market	Industrial Total	Financial Total	Utility Total
					Panel A: Breakdown by Year, All Maturities (Yields)					
1995-2003	5.37	6.19	6.21	6.91	6.50	11.33	7.37	7.76	6.43	7.45
1995	6.95	7.05	7.21	7.53	7.28	9.33	7.49	7.66	7.28	7.51
1996	6.22	6.90	6.99	7.30	7.07	9.38	7.29	7.52	6.95	7.32
1997	6.63	6.86	6.95	7.20	7.02	8.92	7.23	7.41	6.96	7.17
1998	6.15	6.14	6.32	6.77	6.46	9.01	6.81	7.03	6.44	6.68
1999	6.73	6.54	6.79	7.35	6.97	10.35	7.50	7.80	6.99	7.19
2000	6.64	7.26	7.62	8.43	7.90	12.54	8.67	9.04	8.06	8.06
2001	5.01	5.76	6.31	7.34	6.71	12.72	7.94	8.57	6.51	7.21
2002	4.85	5.14	5.57	7.06	6.28	13.51	7.81	8.18	5.79	8.84
2003	3.67	4.25	4.45	5.28	4.84	9.85	6.06	6.45	4.70	6.43
					Panel B: Breakdown by Year, All Maturities (Spreads)					
1995-2003	39	96	126	211	158	695	255	292	159	271
1995	53	68	88	119	94	308	116	128	104	110
1996	0	71	85	116	92	329	115	130	94	113
1997	23	70	79	99	84	282	106	117	91	98
1998	65	85	104	144	116	381	152	171	125	136
1999	88	101	124	181	142	485	197	221	157	160
2000	45	118	152	232	179	639	256	293	193	198
2001	34	135	181	280	220	843	347	407	218	272
2002	12	123	155	293	220	978	380	408	218	468
2003	38	52	96	177	134	669	264	300	155	279

Table III
Sample of Events

I report the list of the ten largest defaults (in order of asset size two years prior to default), the ten largest credit rating downgrades to junk status (in order of asset size two years prior to the downgrade), and all the stock market downturns (3% or more of the S&P 500 index level) for the period 1995-2003.

Panel A: Ten Largest Defaults

Default Date	Company	Asset Size (in billions of U.S. dollars)
6/26/02	Worldcom	99
8/12/02	Conseco	59
2/26/02	Williams Cos.	40
11/9/01	Enron	33
12/13/01	Global Crossing	30
12/2/02	United Airlines	26
6/3/03	Mirant	23
5/16/02	Adelphia Comm.	21
1/16/01	PG&E	21
1/16/01	Southern Cal. Edison	18

Panel B: Ten Largest Rating Downgrades to Junk St.

Rating Change Date	Company	Asset Size (in billions of U.S. dollars)
5/9/02	Worldcom	99
5/22/02	Qwest	74
12/13/02	TXU	45
6/12/02	Tyco International	40
6/12/01	Lucent Technologies	39
12/23/03	Firstenergy	37
1/4/01	Edison International	36
9/30/00	Comcast	36
11/9/01	Enron	33
9/26/02	Allmerica Financial	32

Panel C: Stock Market Downturns

Crash Date	S&P 500 Decline	Trigger of Downturn
3/8/96	-3.10%	Stronger-than-expected February jobs report.
10/27/97	-6.90%	East Asian crisis.
8/4/98	-3.70%	Negative sentiment due to continued Asian economic crisis.
8/27/98	-3.80%	Russian debt crisis.
8/31/98	-6.80%	Russian debt crisis.
9/30/98	-3.10%	Decline in global financial markets.
10/1/98	-3.00%	Decline in global financial markets.
1/4/00	-3.80%	Interest rate worries.
2/18/00	-3.00%	Interest rate worries.
4/14/00	-5.80%	Higher-than-expected CPI figure.
12/20/00	-3.10%	Fed did not lower interest rates.
3/12/01	-4.30%	Negative companies' earnings news.
4/3/01	-3.40%	New profit warnings from technology companies.
9/17/01	-4.90%	September 11 terrorist attacks.
9/20/01	-3.10%	September 11 terrorist attacks.
7/10/02	-3.40%	Accounting scandals.
7/19/02	-3.80%	Accounting scandals.
7/22/02	-3.30%	Accounting scandals.
8/5/02	-3.40%	US economic rebound may be weakening.
9/3/02	-4.20%	Weak economic data.
9/27/02	-3.20%	New profit warnings.
3/24/03	-3.50%	Problems with the war on Iraq.

Table IV
Rivals' Reaction to Firm-Specific Events in the Corporate Bond Market

I report the rivals' bond reaction to firm-specific events over the period 1995-2003. CCY(S) refers to the cumulated change in basis points in yields (spreads) between the pre- and post-event windows. CCAY(S) refers to the cumulated change in basis points in the adjusted yields (spreads). The adjustment is calculated by subtracting from the raw bond yields (spreads), the yield of an index with rating and maturity characteristics that are similar to the bond of interest. Fifteen adjustment indexes are constructed based on five rating and three maturity categories using the FISD-NAIC database. The pre-event window covers the days (-7,-2) prior to the event, while the post-event window covers the days (-1,+4). One bond/firm implies that yields (spreads) of every issue are averaged first within the firm, and then across firms. All bonds implies that yields (spreads) are averaged across all firms. Panel A shows the effect on the rival portfolios. Panels B and C separate these portfolios into low and high concentration, using the Herfindahl index. Lower value implies a lower level of concentration (or higher degree of competition). The numbers in parentheses are t-statistics and the numbers in square brackets are t-statistics for differences in subsamples. The superscripts ***, **, * indicate significance at the 1%, 5%, and 10% level, respectively.

Section A: Industry Portfolios

	One Bond/Firm	% Positive	All Bonds
Panel A: All Events (N=76)			
CCY	7.13	45	6.39
	(0.99)		(0.94)
CCAY	-0.01	47	-0.60
	(0.00)		(0.06)
CCS	9.05	51	8.25
	(1.20)		(1.16)
CCAS	0.52	50	-0.70
	(0.05)		(0.07)

Section B: Subsamples of Industry Portfolios

	Low Concentr. Sample (N=57)	High Concentr. Sample (N=19)
One Bond/Firm		
Panel B: All Events (N=76)		
CCY	8.63	2.61
	(0.93)	(0.35)
		[0.50]
CCAY	-2.62	7.79
	(0.20)	(0.95)
		[0.68]
CCS	10.66	4.20
	(1.09)	(0.56)
		[0.53]
CCAS	-3.66	13.09
	(0.27)	(1.26)
		[0.99]
All Bonds		
Panel C: All Events (N=76)		
CCY	7.72	2.41
	(0.88)	(0.32)
		[0.46]
CCAY	-3.66	8.57
	(0.29)	(1.02)
		[0.81]
CCS	9.74	3.79

Table V
Corporate and Treasury Bond Market Reaction to Market-Wide and Firm-Specific Events

I report the corporate and Treasury bond market reaction (in basis points) to market-wide and firm-specific events over the period 1995-2003. Panel A shows the effects on yields and Panel B the effects on spreads. The superscripts ***, **, * indicate significance at the 1%, 5%, and 10% level, respectively.

	No. of weeks in which an event occurs	No. of weeks in which no event occurs	No. of event weeks exhibiting flight to quality	Changes during weeks when an event occurs	Changes during weeks when no event occurs	Difference in changes	t-test for the difference
				Panel A: Yields			
	I. Corporate Bond Market						
Aggr. Market	98	372		3.31	-1.79	5.10	0.88
IG Market	98	372		-1.26	-0.69	0.56	0.33
HY Market	98	372		17.68	-4.47	22.15	1.64*
	II. Treasury Market						
3-month T-Bill	98	372	56	-3.49	-0.42	3.07	2.31**
6-month T-Bill	98	372	65	-3.51	-0.58	2.93	2.45**
1-year T-Note	98	372	68	-4.25	-0.48	3.76	2.97***
2-year T-Note	98	372	65	-4.18	-0.46	3.72	2.55**
3-year T-Note	98	372	65	-4.31	-0.33	3.98	3.07***
5-year T-Note	98	372	66	-4.16	-0.14	4.02	3.06***
7-year T-Note	98	372	62	-3.60	-0.15	3.45	2.70***
10-year T-Bond	98	372	62	-2.99	-0.18	2.81	2.30**
20-year T-Bond	98	372	60	-2.39	-0.16	2.24	2.07**
				Panel B: Spreads			
	I. Corporate Bond Market						
Aggr. Market	98	372		7.31	-1.86	9.17	1.50
IG Market	98	372		2.80	-0.80	-3.60	2.13**
HY Market	98	372		20.82	-4.20	25.02	1.82*

Table VI
Summary Statistics for Proxies of Liquidity and Information

I report summary statistics for various proxies of liquidity and information for the corporate and Treasury bond market. The corporate bond market period that I examine is from 1995-2003. For the Treasury market, the sample on bid-ask spreads covers the period January, 1997 to September, 2002, on on-the-run/off-the-run yield spreads from January, 1997 to April, 2000, and on price impact coefficients from January, 1997 to April, 2000. All three samples are at weekly frequency.

Panel A: Corporate Bond Market (Av. Bid-Ask Spreads in cents/$100 par for a 1-day window)

	No. of Bonds	No. of Bond Days	Mean	Median	St. Dev.
Aggr. Market	5,527	19,047	14	0	97
IG Market	4,566	16,150	18	1	88
HY Market	1,232	2,897	-13	0	132

Panel B: Corporate Bond Market (Av. Bid-Ask Spreads in cents/$100 par for a non-overlapping 2-day window)

	No. of Bonds	No. of Bond Days	Mean	Median	St. Dev.
Aggr. Market	5,809	28,145	17	2	101
IG Market	4,800	23,951	18	1	88
HY Market	1,325	4,194	-9	0	133

Panel C: Corporate Bond Market (Av. Daily Trading Volume in million of U.S. dollars)

	No. of Obs.	Mean	Median	St. Dev.
Aggr. Market	2,264	608.59	486.65	398.19
IG Market	2,263	549.52	440.45	362.90
HY Market	2,250	59.68	41.08	57.59

Panel D: Corporate Bond Market (Av. Daily Trading Frequency in number of transactions)

	No. of Obs.	Mean	Median	St. Dev.
Aggr. Market	2,267	201	162	122
IG Market	2,263	165	136	94
HY Market	2,261	37	23	36

Panel E: Corporate Bond Market (Av. Daily Bond Age in years)

	No. of Obs.	Mean	Median	St. Dev.
Aggr. Market	2,264	2.60	2.52	0.75
IG Market	2,267	2.70	2.62	0.83
HY Market	2,250	2.19	2.11	0.99

Panel F: Treasury Bond Market (Av.Weekly Bid-Ask Spreads)

Issue	No. of Obs.	Mean	Median	St. Dev.
three-month bill	300	0.73 bp	0.66 bp	0.34
six-month bill	300	0.78 bp	0.70 bp	0.27
two-year note	300	0.33 32nds	0.25 32nds	0.19
five-year note	299	0.70 32nds	0.54 32nds	0.42
ten-year bond	298	1.18 32nds	0.98 32nds	0.58

Panel G: Treasury Bond Market (Av. Weekly On-the-Run/Off-the-Run Yield Spreads in basis points)

Issue	No. of Obs.	Mean	Median	St. Dev.
three-month bill	183	16.85	17.17	5.88
six-month bill	180	13.46	13.36	4.85
two-year note	209	3.89	3.39	3.44
five-year note	209	9.18	7.11	6.69
ten-year bond	209	10.73	9.50	5.51
thirty-year bond	208	9.51	8.41	4.78

Panel H: Treasury Bond Market (Av. Weekly Price Impact Coefficients)

Issue	No. of Obs.	Mean	Median	St. Dev.
three-month bill	174	0.15 bp	0.14 bp	0.07
six-month bill	174	0.14 bp	0.13 bp	0.05
one-year bill	174	0.12 bp	0.11 bp	0.05
two-year note	174	0.05 32nds	0.04 32nds	0.02
five-year note	174	0.10 32nds	0.09 32nds	0.04
ten-year bond	174	0.19 32nds	0.18 32nds	0.07

Table VII
Differences in Proxies of Liquidity and Information between Event and Non-Event Weeks

I report differences in levels of proxies of liquidity and information for the corporate and Treasury bond market between event and non-event weeks. The corporate bond market period that I examine is from 1995-2003. For the Treasury market, the sample on bid-ask spreads covers the period January, 1997 to September, 2002, on on-the-run/off-the-run yield spreads from January, 1997 to April, 2000, and on price impact coefficients from January, 1997 to April, 2000. All three samples are at weekly frequency. The superscripts ***, **, * indicate significance at the 1%, 5%, and 10% level, respectively.

	No. of weeks in which an event occurs	No. of weeks in which no event occurs	Weeks when an event occurs	Weeks when no event occurs	Differences	t-test for the difference
Panel A: Corporate Bond Market (Mean level of Bid-Ask Spreads for a 1-day window in cents/$100 par)						
Aggr. Market	98	371	16	19	3	1.25
IG Market	98	371	22	22	0	0.24
HY Market	95	300	-7	-1	6	1.00
Panel B: Corporate Bond Market (Mean level of Bid-Ask Spreads for a 2-day non-overlapping window in cents/$100 par)						
Aggr. Market	98	372	20	22	2	0.59
IG Market	98	372	26	25	1	0.58
HY Market	95	322	0	2	2	1.02
Panel C: Corporate Bond Market (Sum of Trading Volume in million of U.S. dollars)						
Aggr. Market	98	372	3,980	2,660	1,320	7.65***
IG Market	98	372	3,590	2,400	1,190	7.72***
HY Market	98	372	390	258	132	5.56***
Panel D: Corporate Bond Market (Sum of Trading Frequency in number of transactions)						
Aggr. Market	98	372	1,330	873	457	8.10***
IG Market	98	372	1,053	724	329	7.87***
HY Market	98	372	273	149	124	7.68***
Panel E: Corporate Bond Market (Mean level of Bond Age in years)						
Aggr. Market	98	372	2.76	2.54	0.22	3.83***
IG Market	98	372	2.91	2.62	0.28	4.40***
HY Market	98	372	2.22	2.10	0.12	1.79*
Panel F: Treasury Bond Market (Bid-Ask Spreads)						
three-month bill	81	219	0.84 bp	0.69 bp	0.15 bp	3.07***
six-month bill	81	219	0.89 bp	0.73 bp	0.16 bp	4.78***
two-year note	81	219	0.47 bp	0.28 bp	0.15 bp	7.04***
five-year note	80	219	0.59 32nds	0.98 32nds	0.39 32nds	7.80***
ten-year bond	79	219	1.58 32nds	1.04 32nds	0.44 32nds	7.80***
Panel G: Treasury Bond Market (On-the-Run/Off-the-Run Yield Spreads in basis points)						
three-month bill	26	157	14.78	17.19	2.41	1.95*
six-month bill	26	154	11.56	13.78	2.22	2.19**
two-year note	33	176	3.96	3.87	0.09	0.13
five-year note	33	176	10.78	8.87	1.91	1.51
ten-year bond	33	176	12.52	10.40	2.12	2.04**
thirty-year bond	33	175	10.71	9.28	1.43	1.59
Panel H: Treasury Bond Market (Price Impact Coefficients)						
three-month bill	25	149	0.17 bp	0.15 bp	0.02 bp	1.65*
six-month bill	25	149	0.14 bp	0.16 bp	0.02 bp	2.37**
one-year bill	25	149	0.12 bp	0.15 bp	0.03 bp	3.39***
two-year note	25	149	0.06 32nds	0.05 32nds	0.01 32nds	2.69***
five-year note	25	149	0.14 32nds	0.10 32nds	0.04 32nds	3.38***
ten-year bond	25	149	0.24 32nds	0.18 32nds	0.06 32nds	2.79***

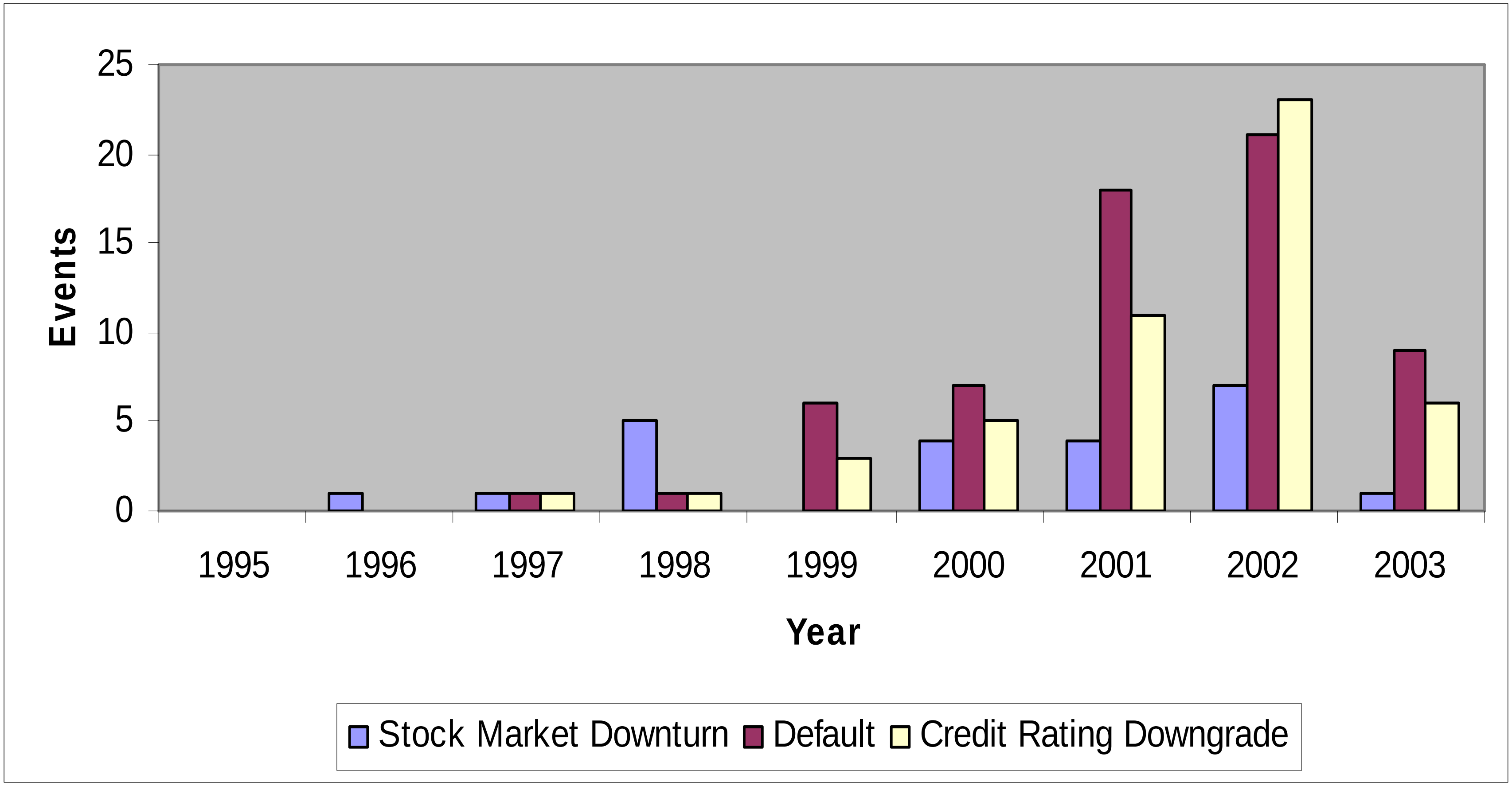

Figure 1. Events at yearly frequency. This figure shows the occurrence of the three types of events (stock market downturns, defaults, and credit rating downgrades) at yearly frequency.