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Lessons from the Norwegian Banking Crisis (1988-1991)

Abstract

This paper measures the economy-wide impact of bank distress on the loss of relationship benefits. We use the near-collapse of the Norwegian banking system during the period 1988 to 1991 to measure the impact of bank distress announcements on the stock prices of firms maintaining a relationship with a distressed bank. We find that although banks experience large and permanent downward revisions in their equity value during the event period, firms maintaining relationships with these banks face only small and temporary changes, on average, in stock price. In other words, the aggregate impact of bank distress on the real economy appears small. We analyze the cross-sectional variation in firm abnormal returns and find that firms that maintain international bank relationships suffer more upon announcement of bank distress.

JEL code: G21, C41

Keywords: bank relationship, bank distress, Norwegian banking crisis.

1 Introduction

The impact of bank distress on real economic activity is a recurrent, yet contentious, subject of study. Many macroeconomists maintain that large-scale interruptions in normal banking activities propagate negative shocks to the real sector. For example, Bernanke (1983) argues that the systematic failure of banks exacerbated the decline in the U.S. economy during the Great Depression years by cutting off valuable financing to borrowers dependent upon bank lending. Microeconomists often advocate a similar point. For instance, Slovin, Sushka and Polonchek (1993) interpret a 4% decline in the stock price of firms borrowing from Continental Bank upon its collapse as evidence that bank distress impairs valuable firm-bank relationships. Still, other researchers view banks as transactions centers performing functions that are easily substitutable by public capital markets. These researchers, exemplified by Black (1975), Fama (1980), King and Plosser (1984), see nothing special about the services banks provide and reason that the causality of any correlation between real economic activity and the health of the banking system runs from the real economy to banks.[1]

We investigate the economy-wide costs associated with bank distress using the Norwegian banking crisis of 1988-1991 as our laboratory for study. The data compiled for this paper permit us to link the Norwegian banks involved in the crisis to their commercial customers. Using these links, we measure the impact of bank distress announcements upon the stock price of firms related to the troubled banks. This enables us to make inferences that have implications in banking at both the macroeconomic and microeconomic level. For instance, the fact that our sample covers 90% of all commercial bank assets, and nearly all of the exchange-listed firms in Norway, affords us the opportunity to track the influence of the deterioration of an entire banking system on the real economy of the country. Moreover, because our sample includes multiple distress events impacting a variety of

types of firms, our firm-bank links enable us to make large sample inferences about the value of bank relationships on a firm by firm level.

The Norwegian banking crisis presents an ideal setting for studying the economy-wide costs associated with the interruption of a bank relationship. The crisis was economically significant. During the crisis years, banks representing 95% of all commercial bank assets in Norway became insolvent, forcing the Norwegian government to bail out numerous financial institutions, including Norway's three largest banks. In addition, banks are an important source of funds to companies in Norway. Most (91%) of the commercial debt in Norway is raised through bank loans, and many (75%) of the firms maintain a relationship with only one bank. This assures that we isolate the impact of bank impairment on each firm's primary, if not only, source of debt financing.[2] Finally, the nature of the Norwegian banking crisis lends itself to straightforward measurement. In contrast to the ongoing Japanese financial crisis, the Norwegian banking crisis has a distinct beginning and end. Numerous documents and media articles exist detailing the events of the crisis, allowing us to easily catalogue the evolution of the crisis over its entire four years.

Overall, our evidence suggests that shocks to the banking system during the crisis had little impact on the welfare of the firms maintaining relationships with the distressed banks. A preview of our results is contained in Figure 1, which jointly graphs the stock price performance of value-weighted portfolios of (1) all firms on the Oslo Stock Exchange (OSE), (2) all banks on the OSE, and (3) stock market indexes from Germany, Japan, the U.S. and the U.K. a value-weighted portfolio. From 1988 through 1991, Norwegian bank stocks lost 84% of their value. However, during the same period, the value-weighted portfolio of all listed firms in Norway *climbed* 63%, outpacing the average performance of firms in other stock markets around the world. The event-specific results contained in this paper provide a concise follow up to the patterns in Figure 1. We document that banks, on

average, experienced a cumulative abnormal return of -10.6% in the three days surrounding their distress announcement and -11.7% over a longer, seven-day window. (The three-day measure alone captures 38% of the total decline in Norwegian bank stock prices during the crisis period.) In contrast, the average cumulated abnormal returns to firms maintaining relationships with these distressed banks was -1.4% over the three-day event window surrounding the distress event and +0.7% over a seven-day event window. Those distress events occurring early in chronological time appear to have the most negative impact on firm abnormal returns, but these first distress events are also small banks with few customers. Moreover, when we study the cross-sectional variation in firm abnormal returns as a function of firm and relationship-specific characteristics, we find abnormal returns to be lower for firms maintaining international bank relationships. Many other firm-specific characteristics contribute no explanatory power to the cross-sectional regressions.

The rest of the paper is organized as follows. Section 2 contains an overview of the relevant theoretical and empirical literature. Section 3 provides a summary account of the major events surrounding the Norwegian banking crisis. Section 4 motivates our choice of six bank distress events and introduces the econometric methodology used in our paper. Section 5 contains the event study results, Section 6 reports the outcome of the cross-sectional regressions, and Section 7 concludes.

2 Literature Review

This section reviews the underpinnings of theories on the value of bank relationships and argues that bank default can upset the flows of relationship benefits. The section then covers recent empirical research measuring the impact of bank distress on firm performance.

2.1 Theoretical background

Theorists, such as Bernanke (1983) and Diamond (1984), argue that it is the ability of banks to bridge

information asymmetries in credit markets, and lend to informationally troubled firms, that makes banks special relative to other financial institutions.[3] The theoretical arguments are predicated on the belief that banks gain substantial knowledge about the payment ability of customers through the array of services that they provide to their customers. Banks can use this intimate knowledge to establish and maintain an implicit agreement with their customers (a "relationship") to continue doing business. According to the theorists, relationships are potentially valuable to banks and customers because they improve contracting flexibility (Boot and Thakor (1994) and von Thadden (1995)), reduce agency problems (Rajan (1992)), enable reputation-building (Diamond (1991)), and ensure confidentiality (Campbell (1979), Bhattacharya and Chiesa (1995), and Yosha (1995)). Bank relationships are especially valuable to firms that to small startup firms that do not have easy access to alternative forms of financing.

Bank default halts the flow of such relationship benefits to the firm and risks the loss of informational capital built up by the bank. In the case of such loss, firms may be forced to seek costly financing alternatives or to queue up alongside other firms to seek a new bank relationship. Even temporary bank distress can decrease the value of bank relationship benefits. For example, a distressed bank could be less forthcoming and flexible in debt renegotiations, deny credit extensions, or spend fewer resources on control. Moreover, public financial markets could penalize firms related to distressed banks because bank distress could indicate bad monitoring, or a poor choice of loan customers. In general, a strong bank relationship should make the firm dependent upon the financial health and the willingness of the bank to extend credit.

Bernanke and Blinder (1988) and Kashyap, Stein and Wilcox (1993) argue that monetary policy influences real output through a “credit channel”, in addition to the more common “money channel”. In their models, a reduction in bank reserves through monetary contraction forces banks to

cut off valuable financing to the segment of borrowers dependent on bank financing. This reduces aggregate output because the bank-dependent borrowers have no alternative source of financing and must forego valuable investment opportunities. As argued by Bernanke (1983) with reference to bank failures prior to the Great Depression, a similar contraction in aggregate output should occur when bank lending is systematically reduced by a banking crisis.

2.2 Previous empirical work

Motivated by information-based theories on the value of bank relationships, Slovin et al. (1993) examine the wealth impact of Continental Illinois Bank's de facto failure on 29 publicly traded firms that maintained a lending relationship with the bank at the time of the distress announcement. They show that these firms lost an average of 4.2% of their market value over three days prior to the announcement by the Federal Deposit Insurance Corporation (FDIC) that the bank would be bailed out. The firms then gained 2.0% of their value back over the day before and day of the FDIC announcement. Slovin et al. (1993) interpret their evidence as suggesting that costs associated with the loss of bank relationship benefits can be substantial. More recently, Hubbard, Kuttner and Palia (1999) relate the pricing of a large cross-section of commercial loans to the characteristics of the banks making the loans and the firms taking the loans. Although they do not directly study the impact of bank distress on the relationship firms, Hubbard et al. (1999) show that borrowing costs are higher at weak banks (banks with low capital ratios) than at strong banks (banks with high capital ratios). Moreover, they show that these differential costs have the greatest impact on borrowers argued to be the most informationally sensitive.

Several recent studies use the Japanese banking crisis to investigate the relation between the health of the bank and the performance of the firm. Gibson (1995) reports that Japanese firms

maintaining a bank relationship during the with a weak bank (bank with poor a credit rating) during the 1991-92 period expended significantly lower amounts on new investment than firms associated with banks with high credit ratings. Gibson (1997) reports similar results for the 1994-95 period. Kang and Stulz (1999) find that firms with close banking relationships performed worse during and after the 1990-1993 deflation of the Japanese stock market when their "main" banks were also facing financial problems.

A growing body of work exists to support the idea that a credit channel is a relevant part of monetary transmission. For instance, Bernanke and Blinder (1992) find that U.S. bank loan volume is negatively related to changes in the Federal funds rate. They argue that this correlation is consistent with the existence of a credit channel. Kashyap et al. (1993) document a rise in commercial paper issuance and a fall in bank loans during monetary contractions, suggesting that firms are forced away from bank loans into the commercial paper market during monetary contractions. The shift away from the bank loans to commercial paper is also coincident with declines in investment in inventories and equipment. Hoshi, Scharfstein and Singleton (1993) report results similar to Kashyap et al. (1993) using Japanese data. Kasyhap and Stein (1997) use a large sample of bank balance sheet data to demonstrate that more liquid banks are less likely to reduce lending during monetary contractions than less liquid banks.

Several papers have previously investigated the interaction between firm and bank performance during the Norwegian banking crisis. Kaen and Michalsen (1997) investigate the effects of contagion in an economy by examining the impact of 24 separate bank distress announcements on bank and non-bank stock price indices. In contrast to most U.S. studies, they find some evidence of contagion throughout the entire Norwegian banking industry following the distress announcements, and some effects on other sectors. However, no attempt is made to directly link bank problems to

relationship firms. Using time-series techniques, Andrade, Clare and Priestley (1997) show that shocks to the Norwegian bank stock index during the crisis period temporarily affected the volatility of other stock market industry indices, while Clare and Priestley (1998) estimate bank default probabilities using the information in the volatility of the bank stock price index.

3 The Norwegian Banking Crisis

In this section, we detail the evolution of the Norwegian banking crisis. We base our account of the Norwegian Banking Crisis on the summary provided in Drees and Pazarbasioglu (1995), annual reports from the Norwegian Banking, Insurance, and Securities Commission (1984-1994), and various newspaper articles dating from the period of the crisis.

On March 18th 1988, Sunnmørsbanken, a small commercial bank in western Norway, issued an earnings report warning that it had lost all of its equity capital. This event marked the beginning of the Norwegian Banking Crisis, a four-year period in which 13 banks, representing over 95% of the total commercial bank assets in Norway, either failed or were seriously impaired.[4] The scars of this dramatic chapter in Norwegian financial history remain visible today, eight years after its poignant finale. For example, the Norwegian Government continues to hold controlling stakes in Norway's two largest commercial banks and the stock market value of the surviving banks remains far below pre-crisis levels.[5]

The evolution of the Norwegian banking crisis follows a pattern similar to that of the "classic financial panic" described by Kindleberger (1996). A *displacement* - substantial and rapid financial deregulation in the mid-1980s - ignited *overtrading* in the form of a boom in bank lending. In the midst of the credit expansion, a sudden decline in oil prices precipitated a fall in asset values in Norway. Many weak firms went bankrupt, imperiling the asset value of the banks tied to the

bankrupt firms. This led to *revulsion* in trading, or greatly reduced bank lending, which eventually spread through the entire banking system.[6]

Prior to the mid-1980s, regulations limited both the quantity and rates at which Norwegian banks could lend. So-called “interest rate declarations” set upper limits on average bank loan rates. Restrictive reserve requirements, regulations requiring banks to invest in government bonds, and direct controls on lending by state-owned banks facilitated the rationing of credit at the artificially low loan rates. According to Drees and Pazarbasioglu (1995), excess demand for credit helped cement strong relationships between borrowers and their banks. Bank profitability was ensured by the absence of inter-bank and international bank competition.

Deregulation began in earnest in 1984. In that year, authorities relaxed reserve requirements, allowed subordinated debt to be counted as bank capital, and opened up Norway to competition from foreign banks by allowing seven foreign banks to establish "daughter" banks inside Norway.[7] The year 1984 also saw the establishment of Oslobanken, the first new commercial bank to be opened in Norway since 1961. In 1985, the Norwegian government lifted all interest rate declarations, phased out bond investment requirements, and consolidated all bank oversight responsibilities under one authority, the Banking, Insurance, and Securities Commission (BISC). Further restrictions on competition were relaxed in 1986 when foreign banks were permitted to open branches in Norway. By 1986, the foreign banks, as well as five newly created Norwegian commercial banks, intensified the competitive pressure on existing Norwegian financial institutions. Banks began to aggressively expand credit in an attempt to maintain market share.

The bottom of Figure 1 reports the annual real growth rate in lending by financial institutions to the Norwegian public for the years 1983-1995. The figure also reports the movement in some

important macroeconomic variables during the same time period. Between 1984 and 1986, the Kroner volume of lending by financial institutions to firms and households in Norway grew at an annual inflation-adjusted rate of 12%, roughly three times the average growth rate in the years prior to deregulation. A large portion of this unprecedented growth came from smaller commercial banks and savings banks and went to financing small and newly established firms, especially firms in cyclically sensitive industries like real estate, construction, and service industries (Drees and Pazarbasioglu (1995)).

The exuberant expansion in bank lending ended in 1987. Meanwhile bank loan losses began to accumulate. During 1986, the price of North Sea Brent Blend crude oil fell from $27 a barrel to $14.50 a barrel, precipitating a sharp decline in real asset values in the oil-dependent Norwegian economy. Subsequently, real loan growth slowed to 3.6% in 1988 and 2.8% in 1989. Existing loans to cyclically sensitive firms also came into jeopardy. Total bankruptcies in Norway increased from 1,426 establishment in 1986 to 3,891 in 1988 and 4,536 in 1989, with most increases occurring in the real estate, transport, construction, retail store, fishing, hotel, and restaurant industries.[8] Paralleling these bank failures, commercial loan losses, measured as a percentage of total bank assets, rose from a level of 0.47% in 1986, to 1.57% in 1988, and 1.60% in 1989. The transition from a tightly regulated economy to a more competitive financial marketplace accentuated the losses through poor decision-making, high risk-taking, and outright fraud.[9]

Sunnmørsbanken was the first bank to announce insolvency due to large loan losses. Similar announcements followed from three other small commercial banks and four savings banks. All of these banks were located in northern or western Norway, the regions in which most business failures were occurring. At the time of the initial announcements of distress, the Norwegian government had no program for shoring up the capital of the troubled banks, nor did it sponsor any form of deposit

insurance. Instead, the banking industry managed its own deposit insurance system. It was this system - known as the Commercial Bank Guarantee Fund (CBGF) - that first injected capital into the troubled banks. While the CBGF was responsible for covering depositor claims at the troubled banks, the BISC guided the bailout of the banks. One commercial bank, Norion, was taken over by the government. The other banks were merged with healthier banks. By the spring of 1990, capital injections from the CBGF and consolidations proposed by the BISC appeared to put to rest the outbreak of bank insolvencies.[10]

However, newspaper reports surfaced in late 1990 and early 1991 that Norway's three largest commercial banks were now in trouble. Early in December 1990, Norway's third largest commercial bank, Fokus, announced large losses due primarily to the poor performance of its existing loan portfolio. Fokus Bank had recently acquired two of the original troubled commercial banks. Later in December, Norway's second largest commercial bank, Christiana Bank, announced an unexpected upward adjustment in loan losses, and requested an injection of capital by the CBGF. Christiana Bank had earlier acquired Sunnmørsbanken, the bank to first announce failure. Within two weeks of the Christiana Bank news release, Norway's largest commercial bank, Den norske Bank, also announced an upward revision in its loan loss estimates. All three of the banks publicly recognized that funds previously available through international markets had now dried up or become prohibitively expensive.[11] The magnitude of the losses at Fokus Bank became apparent in February 1991 when the CBGF announced that a bailout of the bank had depleted nearly all of the remaining capital in the private insurance fund.

Without further aid, the entire banking system was in danger of collapsing. On March 5, 1991, the Norwegian parliament allocated Kr 5 billion to establish the Government Bank Insurance Fund (GBIF). The money in the GBIF was made immediately available for use by the CBGF to

finish the bailout of Fokus Bank and to begin injecting capital into Christiana Bank. Shortly after the establishment of the GBIF, Den norske Bank announced that it would also need a large capital infusion to sustain operations. By June 1991, it became clear that the Kr 5 billion used to start the GBIF would be inadequate for bailing out all three of Norway's largest banks. After six months of debate as to how to resolve the worsening crisis, the Norwegian parliament increased the size of the GBIF, created a new fund called the Government Bank Investment Fund, and amended existing laws to force each bank to write down its share capital. By the time the final bailout was arranged for Christiana Bank and Den norske Bank in late 1991, the total size of the government's guarantee funds had quadrupled to Kr 20 billion, an amount equal to 3.4% of GDP at that point in time. Subsequent to the bailouts, the Norwegian government became the sole owner of Fokus, and controlled 98% and 55% of the voting equity in Christiana Bank and Den norske Bank, respectively. According to Drees and Pazarbasioglu (1995), by this time, the Norwegian government controlled 85% of the commercial bank assets in Norway.

The Norwegian Banking Crisis was traumatic and took four years to unfold. Yet during this whole ordeal, real activity was never particularly depressed and stock market investors were relatively bullish about the present and future profitability of the Norwegian economy. As indicated by Figure 1, Norwegian bank stocks plunged during the crisis period, while the value-weighted OSE index grew at a rate that outpaced other large stock markets. This seeming disconnection between the financial and the real sector is puzzling, especially for an economy where 91% of all commercial debt is financed by either a bank or non-bank financial intermediary. In the next sections, we study in more detail this pervasive financial crisis, and its impact on the real economy, using event study methodology.

4 Relationship Data and Event Study Methodology

In this section, we first introduce the two data sets we match in order to study the stock price impact of bank distress announcements on firms maintaining relationships with the distressed banks. The first data set consists of panel information on the bank relationships of firms listed on the Oslo Stock Exchange (OSE). The second data set identifies the dates of the announcement of bank distress. The section then provides a brief overview of the event study methodology to be used in the analysis.

4.1 Relationship data

We obtain information on firm-bank relationships from data compiled by Ongena and Smith (1999b). For their study, Ongena and Smith (1999b) collect annual information on the identity of bank relationships maintained by non-financial firms listed on the OSE between 1979 and 1995.[12] Their sample covers, on average, 95% of all firms listed on the OSE during that period. Although these firms represented less than 0.10% of the total number of incorporated companies in Norway, their total market value in 1995 equaled 45% of Norway's GNP. During an average year, 74% of the firms maintain a relationship with only one bank, another 17% maintain a relationship with two banks, 7% maintain three bank relationships, and only 2% maintain four or more bank relationships. The firms in the data set maintain relationships with a total of 55 different banks, including 24 Norwegian commercial banks, 15 international commercial banks, and 17 Norwegian savings banks. However, the relationships are concentrated among Norway's two largest banks. Approximately 75% of the firms in the data set maintain at least one relationship with Christiana Bank or Den norske Bank.

Table 1 provides an annual overview of the turnover in bank relationships, along with an overview of the total number of firms listed on the OSE, the total number of bankruptcies in Norway (public and private), and the number of firms delisting from the OSE each year. On average, the OSE

lists 130 firms. The number of firms going public to list on the exchange increased markedly during the early 1980s, reflecting both substantial deregulation in banking and a modernization of stock market regulations.[13] With the exception of 1990, the number of delistings per-year remained relatively constant throughout the crisis period, even as total bankruptcies in the country rose. In fact, the *net* number of firms listing on the OSE grew each year after 1990.

Table 1 also indicates a substantial increase in the turnover of bank relationships beginning in 1986. The number of firms starting new relationships and ending existing relationships tripled in 1986, compared to the average turnover in prior years. This pattern persists through 1988. Beginning in 1989, firms scaled back on the number of relationships that they terminated, but continued to add new relationships at a rate triple to the rate prior to deregulation. The pattern in bank relationship terminations suggests the possibility that firms switched out of distressed banks prior to the beginning of the banking crisis. However, this is not to be the case. Only three of the 46 bank relationship relationships terminated during the 1986-88 period were with one of the original troubled banks. Most of the terminations during the period were with international banks (24%) or with one of Norway's two largest banks, Christiana Bank or Den norske Bank (59%).

To complete the data compilation for this paper, we match the Ongena and Smith (1999b) relationship data with a set of announcements of distress made by banks involved in the Norwegian banking crisis. To identify announcements of bank distress, we start with a list of crisis-related event dates from Kaen and Michalsen (1997). The Kaen and Michalsen (1997) list contains all crisis-related bank announcements that were either archived by the OSE wire service or were later provided in annual reports of governmental and quasi-governmental agencies. We supplement the Kaen and Michalsen (1997) list with our own collection of bank distress-related announcements gathered from stories appearing in major Norwegian newspapers during the crisis period. We define an event date to

be the earliest day a particular story was released by a government agency, reported across a news wire, or printed in a newspaper. From the complete list of announcements, we select those event dates deemed to be the first material announcement of distress by a bank. Such an announcement commonly includes statements about severe loan losses, inadequate reserves, or large capital losses. We obtain thirteen announcements covering a period between March 1988 and January 1991.

We include, as an additional event, the announcement on June 17, 1991 that the CBGF endorsed the application for preference capital by Den norske Bank and Christiana Bank. This endorsement was the first indication that the magnitude of the losses at Norway's two largest banks far outstripped the existing capital of the government guarantee fund. This date was also the effective start of a series of highly publicized parliamentary and newspaper debates discussing the prospect for rescue. These debates culminated in the takeover of the two banks by the government of Norway in late 1991.

In matching the bank announcements with firm-bank relationships, we require the distressed bank to be associated with at least one firm from the Ongena and Smith (1999b) database. Because some of the crisis banks do not service publicly traded firms, our criterion leaves us with five banks and six distress events. In 1990, these five banks maintained relationships with 108 OSE listed firms, representing 96% of the firms in our sample at that time. Table 2 contains the event dates and a short description of each distress announcement. The table also contains the number of exchange-listed firms maintaining a relationship with each distressed bank, and the number of exchange-listed firms maintaining relationships with non-distressed banks, during the three years surrounding each distress date. Henceforth, we refer to firms that maintain a relationship with a distressed bank as “related firms” and those that maintain relationships with non-distressed banks as “unrelated firms”. We obtain a total of 217 related firm observations and 447 unrelated firm observations across the six

events.

To conduct the event study analysis, we obtain daily stock price data from *Oslo Børs Informasjon*, an information subsidiary of the OSE. The OBI data set contains some recording errors. For the results reported in this paper, we record as "missing" realized daily returns in absolute value larger than 100%. Our results are unaffected when we alter the cutoff imposed by this screen. Our analysis also requires that we have a complete stock price history for the firms in the 290 trading days around the distress event and complete accounting information in the year prior to the event. With this screen in place, we are left with 169 related firm observations and 267 unrelated firm observations.

We report results using both the OSE index and the world market index as the benchmark market return. Judging abnormal returns relative to a world market index sidesteps biases in the OSE created by the correlation between the Norwegian economy and the bank crisis. For example, estimates of event day abnormal returns will be biased upward if the Norwegian stock market falls on news correlated with a bank's announcement of distress. By measuring abnormal returns relative to a world index, we isolate the impact of the distress announcement on the firms related to the bank. We construct the world market index from daily, value-weighted US, Japanese, UK, and German stock market returns using data from Datastream. Each country receives a weight in the world index proportional to its US dollar market capitalization as of July 1st, 1987.

4.2 Event study methodology

Our methodology for studying the impact of bank distress announcements parallels standard event studies. To obtain estimates of abnormal returns, we run market model regressions of the realized daily stock return for event portfolio j, r_{jt}, on a measure of the realized daily return of the market

index, r_{mt}, and a set of daily event dummies, d_{jkt}, which take the value of one when *t* is a day inside the event window, and zero otherwise,

$$(1) \qquad r_{jt} = \alpha_j + \beta_j r_{mt} + \sum_{k=-20}^{20} \gamma_{jk} \delta_{jkt} + \varepsilon_{jt}, \quad t = -170, -169, ..., 120.$$

We index dates inside the event window by *k* and allow for window lengths of up to 40 trading days around the event date. The coefficients g_{jk} measure daily abnormal returns during the event period. For the results reported in the tables, we start the estimation 150 days prior to the start of the event window and end the estimation 100 days following the event window. Hence the total number of daily observations used in the estimation is 291. Because non-trading of stocks is a common problem on the OSE, we check all our results by adding three lead and lagged values of the market index to (1) to correct for non-synchronous trading. When reporting event-specific statistics, we correct the standard errors of the abnormal return estimates using a Newey and West (1987) weighting matrix with five lags. Sums of the daily abnormal return estimates $\hat{\gamma}_{jk}$ over various windows yield cumulative abnormal return (CAR) estimates, which can be tested for significance using a Wald test.

5 Impact of Bank Distress Announcements

In this section, we present the results of the event study analysis. We study the stock price impact of the bank distress announcement on related firms on an event-by-event basis. We also report measures of the aggregate impact of bank distress across all related firms, and compare this impact to stock price movements in unrelated firms. However, before analyzing the abnormal returns to related firms, we study the impact of the distress announcement on the banks themselves.

5.1 Banks in Distress

We begin this section by examining the stock price impact of distress announcements on the banks making the announcement. The bank CARs act as a joint measure of the magnitude of the distress announcement and the informativeness of the chosen event dates. Table 3 reports the CAR estimates using both the Norwegian market index (labeled "OSE") and the world market index (labeled "World") over various windows leading up to, and surrounding, the event date. In general, the two benchmarks produce similar CAR estimates. When reporting results in the text, we focus on estimates measured relative to the world market index, but note substantial differences between the two measures when they occur.

Stock price data for *Sparebanken Nord-Norge* are not available before 1994, so this bank is excluded from Table 3. For the remaining banks, the CAR estimates are negative, relatively large, and statistically significant, independent of the choice of market index. The three-day abnormal return estimates range from a low of -2.8% for Sunmørsbanken surrounding its announcement on 3/18/90 to a high of -19.2% for Fokus Bank surrounding the announcement on 12/11/90.

On average, the CAR estimates for the banks are statistically zero prior to the announcement of distress, and roughly -10% after the announcement. We report the average of the CAR estimates across the events using two formats. The first format takes a simple average of the CAR estimates across all of the events, assumes that the estimates are independent across events, and uses a t-test to judge significance.[14] This method yields cumulative average abnormal return estimates of -10.6% for both the (-1,+1) event window and -11.2% for the (-3,+3) event window. The former estimate is statistically significant at a 1.5% level, the latter estimate is significant at 10%. Averages of the estimates over longer event windows imply that the announcement is not anticipated to the event date

and that the 10% drop is permanent. The average CAR over the 10 trading days leading up to the event is 0.1%, and is not statistically significant. The average CAR for the next 11 trading days (including the announcement day) is 09.6%. The second averaging format estimates the price impact using a seemingly unrelated regression (SUR) that includes all of the bank stocks, and assumes that the price impact across banks is equal. The latter assumption implies that the SUR cumulative abnormal return estimate is a weighted average of the individual bank estimates, with weights proportional to the standard deviation of the error term.[15] The SUR estimates differ only slightly in magnitude from the simple average across all events. However, the SUR estimates are more precise, producing statistically significant estimates over the (-1, +1), (-3, +3), and (0, +10) intervals.

The stock price reactions of the banks suggest that the distress announcements conveyed surprising information to shareholders. The reactions are also meaningful from a macroeconomic perspective. For example, price declines during the (-1,+1) event window around our announcement dates account for 38% of the total price fall in Norwegian bank stocks over the period 1988-1991, while the (-3,+3) event window captures 58% of the total price decline.

5.2 Related Firms

We now turn to examining the abnormal returns of the related firms around bank distress announcements. Table 4 reports event-specific CAR estimates based upon equally weighted portfolios of related firms, grouped by event. The table also contains CAR estimates based on an average of all of the related firms in the sample, and estimates of the difference in CARs between related and unrelated firms.

Firms banking with the first three banks to fail experienced large downward revisions in their stock prices upon the announcement of bank distress. Judged relative to the world market index over

the (-1,+1) event window, the portfolio of firms related to Sparebanken Nord-Norge fell by 26%, and the portfolios of firms related to Sunnmørsbanken and Fokus Bank declined by 6%. For the remaining events, the impact of the distress announcement was weaker. Firms related to Christiana Bank and Den norske Bank experienced an average abnormal decline of 2.2% and 2.8%, respectively, in the three days around each of the banks' first announcement of distress. These same firms experienced an abnormal decline of only 0.3% upon the announcement that their banks' losses exceeded the existing capital of the government guarantee fund. Over longer event windows, the impact of the announcement is unclear. Over the (-3, +3) event window, firms associated with three of the six distress events experienced positive or zero cumulative abnormal returns. Over the (0, +10) window, firms across four of the events experienced non-negative CARs.

The bottom of Table 4 provides two measures of the aggregate impact of bank distress announcements on the stock price of related firms. The first measure averages the CAR estimates across all related firms. To create this average, we estimate the market model regression (1) for each related firm and create CAR estimates based on daily abnormal return estimates $\hat{\gamma}_{it}$, where the index i represents an individual firm. We then calculate the mean CAR across all of the firm estimates. In order to control for the cross-sectional dependence in the estimates of CARs, we generate standard errors from bootstrapped distributions that preserve the cross-sectional dependence in the market model error terms ε_{it} for firms sharing a common event date, but otherwise assume that returns are serially uncorrelated (the Appendix contains a detailed description of the bootstrap procedure). Because 96% of all exchange-listed firms are associated with at least one distressed bank in our sample, the average across all related firms provides a measure of the systematic impact of bank distress on the real sector. Across all related firms, the average three-day CAR, measured relative to the world market index, is -1.4%.[16] This average is statistically significant at less than a 1% level.

Across larger event windows, the average CAR suggests that the price impact on related firms of the bank distress announcement is temporary. Over the seven and twenty day event windows, the CAR estimate is actually positive, though not statistically significant.

Our second aggregate measure compares the announcement day abnormal returns of related and unrelated firms. The negative three-day CAR estimates measured by the average across all related firms could reflect a general downturn in stocks that is not attributable to the loss of bank relationship benefits. Indeed, estimates of abnormal return using the OSE index are usually higher than the world market index, suggesting that the OSE index falls on the event date. By separating OSE firms into a category of related and unrelated firms, we can measure the extent to which a bank announcement directly impacts related firms versus the market as a whole. We construct a "difference portfolio" that assumes that assumes an investor can form a zero cost portfolio before the event date that is long in related firms and short in unrelated firms. The unrelated firms are those OSE firms that do not maintain a relationship with the distressed bank in the year of the event date. We weight each firm in a portfolio by the total number of firms in the sample during that year and calculate the daily abnormal returns on the difference portfolio using the market model regression. (With this weighting scheme, the average across the six difference portfolios reflects the number of firms in each portfolio.) The difference portfolio CAR estimates suggest that the stock prices of related firms fall by more than unrelated firms on event dates, but the difference is not statistically significant.

Although statistically significant, the abnormal price decline of 1.4% is relatively small and temporary.[17] For instance, if we first assume that the 1.4% decline were permanent, the estimate would represent a total loss across all OSE firms of Kr. 3.8 billion (measured in terms of 1990 market value). This loss amounts to about 1/5 of the bailout paid by the Norwegian government to

the depositors at Norway's two largest banks, and about 1/20 of the total estimated losses experienced by the banks between 1988 and 1992.[18] Further, this estimate is only 35% of the magnitude of the loss in equity value estimated by Slovin et al. (1993) for firms related to Continental Illinois. However, the negative impact is temporary. The cumulative abnormal returns over event windows longer than three days are positive and statistically indistinguishable from zero. Moreover, the abnormal returns to related firms are statistically indistinguishable from the abnormal returns on unrelated firms over the same period.

Event-day price drops therefore do not appear to be driven by losses in relationship benefits and announcements of bank distress, though significant for the banks, have little aggregate impact on firms connected to the distressed banks. Overall, we find little support that a systematic bank crisis has any impact on the real economy.

6 Cross-sectional Regressions

Why is the average related firm stock price reaction so small? Why do the non-financial firms do so well over the crisis period as their banks crash? In an attempt to gain some insight into these questions, we now turn to examining in more detail the cross-sectional variation in abnormal return estimates. In this section, we regress three-day related firm CAR estimates on a set of event, firm, and relationship characteristics. We first describe the explanatory variables used in the regressions. The second part of this section contains the results from the regressions.

6.1 Explanatory variables

Our basic regression specification includes six variables that proxy for a firm's dependence on bank financing. We explore whether the stock price reaction of a related firm to the announcement of bank distress is negatively related to these proxies for bank dependence. Unless otherwise specified, we

measure all variables at the end of the year prior to the distress announcement. Our first variable measures the size of the firm. SALES is the logarithm of sales, measured in 1979 Kroner. Our next variable measures the age of the firm. AGE is the number of years the firm has been in operation since its founding date. Both SALES and AGE serve as proxies for the potential information asymmetries faced by firms when seeking new financing. Larger firms are likely to be better known among analysts, news services, and traders than smaller firms, while older firms benefit from an established reputation. Our third variable, DEBT, is the total book value of the debt divided by the sum of the total book value of debt and market value of equity. Because firms in Norway rely heavily on banks for debt financing in Norway, DEBT serves as a proxy for the amount of bank debt a firm carries in its capital structure. The fourth variable, CASH STOCK, is the ratio of cash and marketable securities to the book value of assets. This variable is meant to measure the level of internal financing available to the firm at the time a bank becomes distressed. Firms with higher levels of internal financing should be less dependent on external financing. The fifth variable, DURATION, is the number of years the firm has maintained a relationship with the distressed bank up to the beginning of the crisis in March 1988. We include DURATION as a measure of relationship strength. Longer bank relationships are stronger relationships when the net benefits of a bank relationship increase through time.[19] The sixth variable, INTERNATIONAL, is a dummy variable equal to one when the firm maintains an additional relationship with a non-Norwegian bank, and equal to zero otherwise. Firms maintaining relationships with foreign banks have a source of bank financing external to the crisis in Norway, and therefore should less susceptible to the impairment of their Norwegian bank relationship.

Three additional variables are utilized across some regression specifications to check the robustness of the original results. We include CASH FLOW, defined to be net income plus

depreciation divided by the book value of assets, as an additional measure of the availability of internal funds to the firm. $ISSUE_{YR=-2,-1}$ takes the value of one if a firm issued equity in the two years prior to the year of the bank distress announcement. Similarly, $ISSUE_{YR=-1,0}$ equals one when a firm issued equity in the year prior, or year of, the distress announcement. Holding investment opportunities constant, firms that recently issued equity should be less dependent on new financing than firms that have not issued equity.

The information used to construct the SALES, DEBT, CASH STOCK, and CASH FLOW comes from company financial statements, as provided by the information subsidiary of the OSE. AGE is calculated based on information gathered from *Keirulf's Handbook*, a separate publication of the OSE. DURATION and INTERNATIONAL are tabulated by Ongena and Smith (1999b) using annual information on primary bank relationships provided in *Keirulf's Handbook.* Bøhren, Eckbo and Michalsen (1997) collect equity issuance data directly from company annual reports. We use their data set to calculate $ISSUE_{YR=-2,-1}$ and $ISSUE_{YR=-1,0}$.

Finally, we include two variables directly from the distress announcement to control for possible biases related to anticipation of a distress announcement. As the crisis unfolds, stock market participants could begin to anticipate future bank distress announcement. The anticipated impact of the bank's announcement then will be reflected in firm stock prices prior to the distress announcement. BANKCAR, defined to be the three-day CAR estimate for the distressed bank, provides us with a measure of the level of surprise in the announcement, weighted by the magnitude of the announced losses. Including BANKCAR also controls for variation in the nature of the distress announcement. For example, an official announcement of loan loss adjustments could be perceived differently than unconfirmed rumors of financial problems. The second variable, TIME, is the number of days between the date of a particular distress announcement and the date of the first distress announcement

(March 18, 1988). As the bank crisis unfolds, investor expectations about the entire banking sector could change, altering the informational content of distress announcements for individual banks. If the seriousness of the crisis becomes more apparent as time passes, then new announcements should become less informative over time.

Table 5 reports summary statistics for the variables. The median related firm had sales of Kr 247 million, or roughly $35 million, in the year prior to its bank's distress announcement, while the mean firm was much larger with sales of Kr 1.19 billion ($169 million). The median firm was also 63 years old, maintained a leverage ratio of 60%, held 10% of its assets in the form of cash and cash equivalents, and maintained a relationship with its distressed bank for at least seven years by March 1988.[20]

6.2 Regression results

Table 6 contains the results from regressing three-day abnormal returns (stated in percent terms) on combinations of the explanatory variables. The p-values under the coefficient estimates (in parentheses) are based on the same bootstrapping procedure used in Table 4 that preserves the cross-sectional error structure of firms associated with the same event.

If bank distress adversely affects valuable relationships, then we should expect variables positively related to bank dependence to be negatively related to the three-day CARs. That is, bank relationships should be more valuable to bank dependent firms. Holding BANKCAR and TIME constant, the SALES, AGE, DEBT, CASH STOCK, CASH FLOW, DURATION and ISSUE variables show no statistical relation to the three-day CAR in any of the specifications. Therefore, these variables provide no support for the hypothesis that bank dependent firms suffer more from bank distress.

The coefficient estimates on INTERNATIONAL, are statistically significant at a 5% level in all specifications. However, the sign on INTERNATIONAL is the opposite of what we would expect if the presence of a non-Norwegian bank relationship insures a firm against problems within the Norwegian banking system. The estimate implies that abnormal returns to firms with a foreign bank relationship is 3% lower, or *twice* the magnitude of the average abnormal return, than for firms that do not have a foreign bank relationship. This peculiar result may stem from the fact that the INTERNATIONAL dummy is a proxy for badly performing firms. Visual inspection of the 8% of the firms that maintain a international relationship finds that these firms are mainly shipping and oil-related firms that later experienced financial difficulties. At the time of a Norwegian bank distress announcement, having an international relationship may indicate future problems for the firm that are independent of the bank announcement itself.

Finally, the coefficient estimates on the two control variables, BANKCAR and TIME, are positive and lie at levels of statistical significance between 9% and 10%, suggesting that the firm CARs are negatively related to the level of surprise in the announcement, though at statistically modest levels.

Overall our cross-sectional results provide no support for the idea that bank dependent firms suffered more from than crisis than firms not dependent on banks.

7 Conclusion

The Norwegian banking system was in deep financial trouble between 1988 to 1991. Loan losses exhausted capital at many banks, both private deposit insurance funds went broke, the banking sector collapsed, and Norway's largest banks were ultimately nationalized. Even today, bank stocks have yet to recover from their pre-crisis levels. Nevertheless, stock prices of firms maintaining bank

relationships with distressed banks faced only small and temporary downward revisions to their stock price on the announcement of their banks' distress. In fact, the stock prices of these publicly listed companies grew over the event period, outstripping the average returns on other exchanges around the world. While related firms and firms without a connection to the distressed bank were not affected differently, abnormal returns to stocks of related firms with contemporaneous international bank relationships were significantly and substantially more negative over a 3-day period around the distress announcement dates. Our results suggest that bank distress caused no significant interruptions to the financing and investment abilities of Norwegian firms despite the fact that Norwegian firms are heavily reliant on bank debt as a source of bank financing.

One explanation for our results is that investors anticipated the ultimate rescue of banks by the Norwegian government and believed therefore that all firm relationships were safe. In this case, the large equity wealth loss experienced by the banks simply reflected a transfer of wealth from bank shareholders to the Norwegian government, who would then safely manage the existing firm-bank relationships. However, it is not clear that bailouts, particularly government bailouts, were anticipated at the outset of the crisis. After its share capital was lost in late 1989, Norion Bank was placed under public administration and liquidated. Because Norion was the first bank to be placed under public administration in Norway since 1935, the closure could have promulgated the idea that liquidations would occur at other commercial banks as well. Even if investors believed that large commercial banks were too big to fail, they could not be clear about what the consequences of the government takeover would be.[21] Therefore, we find it unlikely that investors would anticipate a government bailout to be costless if relationships were indeed valuable.

Appendix: Bootstrapping Procedure

We construct the bootstrapped distribution of the average 3-day Cumulative Abnormal Return (CAR) as follows. We start by regressing the realized daily return of the stock for each firm *i*, r_{it}, on the realized daily return on the world market index in period *t*, r_{mt}, and 41 event dummies, d_{jkt}. We also include three leads and lags of the market index to control for nonsynchronous trading,

$$\text{(A.1)} \quad r_{it} = a_i + \sum_{n=-3}^{3} b_{in} r_{m,t+n} + \sum_{k=-20}^{20} g_{ik} d_{jkt} + e_{it}, \quad t = -170, -169, ..., 120; \quad i=1, 2, ..., I.$$

e_{it} is an error term. Let I_j represent the number of firms involved with event *j* and $I = \sum_{j=1}^{6} I_j$.

Denote the estimated coefficients as $\hat{a}_i$, $\hat{b}_{in}$, and $\hat{g}_{ik}$ and define the 3-day CAR for each firm *i* to be the sum of the three estimates $\hat{g}_{i,-1}$, $\hat{g}_{i,0}$, and $\hat{g}_{i,+1}$. For each event we average these CAR's across all firms to obtain the realized average 3-day *CAR*.

We obtain a distribution that accounts for cross-sectional correlation in firm error terms within a given event by drawing 291 times with replacement from t = -170, -169, ..., 120. For each draw, we store the results in a vector. For example, we may obtain a vector (-54, 67, -107, 18, 22, ..., -54, ..., -107, ..., -3). We repeat this procedure for each event, yielding a total of six row vectors, T^j, each with 291 elements, t_t^j. We then calculate for each firm the bootstrapped daily return of the stock, r_{it}^1,

$$\text{(A.2)} \quad r_{it}^1 = \hat{a}_i + \sum_{n=-3}^{3} \hat{b}_{in} r_{m,t+n} + \sum_{k=-20}^{20} \hat{g}_{ik} d_{jkt} + e_{it},$$

t =-170, -169, ..., 120; $t = t^{j}_{-170}, t^{j}_{-169}, ..., t^{j}_{120}$; i=1, 2, ..., I.

Here, we index the return by a superscript '*1*' to indicate this calculation will be the first of a number of N draws. Notice that our bootstrap procedure maintains the event structure of the errors, i.e. for each firm connected to the same event we utilize the same error term chronology.

Next we regress the bootstrapped daily return of the stock for each firm i, r^{1}_{it}, on the realized daily return on the world market index in period t, r_{mt}, and 41 event dummies, d_{jkt}:

$$(A.3) \quad r^{1}_{it} = a^{1}_{i} + \sum_{n=-3}^{3} b^{1}_{in} r_{m,t+n} + \sum_{k=-20}^{20} g^{1}_{ik} d_{jkt} + e^{1}_{it}, \quad t = -170, -169, ..., 120; \; i = 1, 2, ..., I.$$

e^{1}_{it} are the error terms. Denote the estimated coefficients $\hat{a}^{1}_{i}$, $\hat{b}^{1}_{in}$, and $\hat{g}^{1}_{ik}$. We calculate the Cumulative Abnormal Return (-1,+1) for each firm i by summing $\hat{g}^{1}_{i,-1}$, $\hat{g}^{1}_{i,0}$, and $\hat{g}^{1}_{i,+1}$, and average across all firms to obtain the first bootstrapped 3-day average CAR, CAR^{1}.

We repeat the procedure, starting with the drawing with replacement to construct the six vectors of sequencing numbers. We go through the entire procedure N times to obtain a bootstrapped distribution for the average *CAR*, characterized by CAR^{1}, CAR^{2}, CAR^{3}, ..., CAR^{N}.

A similar procedure is then also used to bootstrap distributions for the estimated coefficients in the cross-sectional regressions.

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Notes

[1] Recent studies documenting the correlation between bank crises and real economic activity include Kaminsky and Reinhart (1999) and Demirguc-Kunt and Detragiache (1997).
[2] Proportion of all commercial debt financed by bank loans based on 1994 loans from financial institutions to the commercial sector (Source: *Statistical Yearbook of Norway, 1996*). While bank-dominated on the debt side, Norwegian law prohibits banks from investing more than 4% of their assets in real estate and/or the equity of non-financial companies (*Forretningsbankloven,* 1961, 24 May, Nr. 2, § 24). As of 1994, Norwegian banks owned only 1% of the equity in the non-financial sector (Nilsen (1995)). The proportion of firms maintaining a single bank relationship is reported in Ongena and Smith (1999).
[3] Gertler (1988) and Bernanke (1993) review the role of banks in the macroeconomy, Bhattacharya and Thakor (1993) and Freixas and Rochet (1997) review contemporary microeconomic banking theory, and Ongena and Smith (1999a) review both theoretical and empirical work on bank relationships.
[4] The crisis affected numerous other financial institutions in Norway. Most large savings banks, mortgage companies, and finance companies experienced record losses during the period. By 1993, Norway's insurance industry had deteriorated to the point where the largest insurance provider was forced into government stewardship. The financial crisis also eventually spread to the economies of Sweden, Finland, and Denmark, culminating in what became known as the "Nordic Financial Crisis."
[5] On March 22, 1999, the Norwegian government sold its majority interest in Kreditkassen, retaining 34.6% of the equity (Source: OSE Wire Service Report). By the end of 1998, the OSE value-weighted index of bank stocks remained at level 27.6% below its peak in 1989.
[6] Allen and Gale (1998) develop a model in which credit expansion within the bank sector creates the asset price bubbles which ultimately lead to economy-wide financial panics.
[7] The seven banks included three US banks (Chase Manhattan, Citibank, and Manufacturers Hanover Trust), three French banks (Banque Indosuez, Banque Nationale de Paris, and Banque Paribas), and one English bank (Samuel Montague). The law granting the ability of foreign bank entry required reciprocity by the host country of the bank. Seven Swedish banks were denied permission to set up daughter banks in Norway because Sweden forbade Norwegian entry into its market (Source: *Årsmelding fra Bankinspeksjonen, 1984*).
[8] Source: *Statistical Yearbook of Norway, 1996*.
[9] The BISC observed in hindsight that "there are many examples of weak management and poor credit assessment routines, both at banks and other institutions,"(*Annual Report 1993*, BISC, p. 15). In September 1990, the BISC appointed a commission to investigate whether the behavior of some bank managers during the crisis was criminally fraudulent. By 1995, the committee had completed investigations into 11 financial institutions. The committee found indications of possible criminal acts or negligence in at least four of the institutions. However no formal charges were ever brought against any institution.
[10] *Aftenposten*, the largest Norwegian newspaper, proclaimed on March 16, 1990 that the "Norwegian banking industry had weathered its worst difficulties" and that "the losses appeared now to have flattened out."
[11] According to the BISC, problems in the banking sector, exacerbated by credit rating downgrades, led to a decline in the amount of foreign funds available to Norwegian banks. A confidential report produced in December 1990 by the BISC for the Ministry in Finance stated, "There is a clear cut risk of a systemic crisis among other things as a result of the difficulties in international financial markets"

(*Annual Report 1991*, BISC, p. 4). By the third quarter of 1991, Den norske Bank was forced to abandon plans for a new equity issue, weakening further its capital position.

[12] All firms listed on the OSE must provide annual information on their "primary" bank relationships, up to a maximum of four, as part of the listing requirement. A primary bank connection typically involves short and long-term lending, as well as the frequent purchase of deposit, cash management, foreign exchange, and risk management services.

[13] U.S.-styled insider trading regulations were introduced in 1985. Prohibitions on purchases of shares by foreigners were lifted one year earlier. In 1986, the proportion of OSE firms owned by foreigners was 15%. By 1992, this proportion had increased to 30% (Source: OSE Annual Reports).

[14] I.e., we construct the t-test assuming the CAR's are i.i.d. and

$$\frac{CAR^{b}(-t,+t)}{\left(\frac{\hat{\sigma}^{b}}{\sqrt{6}}\right)} \sim t(6-1)$$

with,

$$\hat{\sigma}^{b}(-t,t) = \left(\frac{6\sum_{i=1}^{6}\left(\sum_{k=-t}^{t}\hat{\gamma}_{ik}^{b}\right)^{2} - \left(\sum_{i=1}^{6}\sum_{k=-t}^{t}\hat{\gamma}_{ik}^{b}\right)^{2}}{6(6-1)} \right)^{1/2}.$$

[15] See Thompson (1985).

[16] This average is considerably smaller (in absolute value) than the mean CAR of –7.4%, measured across the six event portfolios. This is because the portfolio CARs do not reflect the number of firms used to calculate the portfolio. The first three events involve only 14 related firms, while the latter three events impact 176 related firms. On a firm-weighted basis, the latter abnormal return estimates dominate. The 14 firms related to the first three distress events are smaller, younger and have maintained a shorter bank relationship with the distressed bank, than the firms related to the later distressed banks. We return to comparing the characteristics of the firms in Section 6.

[17] In Table 4, we assume that firms maintain relationships with banks throughout the year of the distress event. We cannot observe intra year bank switches because our relationship data is annual. If, within the same year, an event date precedes the date a firm reports their bank relationships to the OSE, we face the danger of excluding firms from an event portfolio that maintain a relationship through the distress period, but drop their bank before reporting time. To account for this bias, we rerun our results assuming a firm is related to the bank it reports in the year prior to the event date. Such a portfolio could also be biased because it will contain relationships that terminate after the previous year's reporting date, but prior to the event. In any case, the results are fairly robust to the switch in definitions. For instance, we find that the average three-day CAR across all related firms is -3.5% and statistically significant (p-value = 1.5%), while the average seven and 21-day CARs are negative but insignificant.

[18] Based on estimates from *Årsmelding 1992*, BISC.

[19] However, observing a long relationship could also indicate that a firm is "locked in" to one bank relationship. In this case, the net benefits of the relationship could decline through time. See Ongena and Smith (1999b) for an empirical investigation of bank relationship duration.

[20] The duration variable is censored from the left because we cannot observe the bank relationship prior to 1979, or prior to the firm listing, whichever comes later. Ongena and Smith (1999b) investigate the impact of censoring on duration estimates.

[21] For instance, on January 21, 1991, *Dagens Næringsliv*, Norway's premiere business daily, cited the uncertain consequences of government bailouts, "It will be exciting to see on paper the conditions the Government Bank Insurance Fund (GBIF) will place on distressed banks . . . Proposed ideas are coming from all directions . . . from the writing down of equity capital, to suspensions in dividend payments, branch closures, and possible reductions in manager salaries."

TABLE 1. ANNUAL OVERVIEW OF TURNOVER IN BANK RELATIONSHIPS, NUMBER OF FIRMS LISTING AND DELISTING ON THE OSLO STOCK EXCHANGE, AND NUMBER OF BANKRUPTCIES.

This table lists, by year, the total number of firms listed on the Oslo Stock Exchange (OSE), the number of new bank relationships, the number of terminated bank relationships, the number of firms listing and delisting from the OSE, and the total number of firms declaring bankruptcy in Norway. The crisis years are indicated in bold. A bank relationship in this table is a 'primary' bank relationship, as defined by the firm and reported in *Kierulf's Handbook*. We identify a firm as ending a relationship when it drops a bank from the list or replaces one bank with another. Information on bank relationships comes from *Kierulf's Handbook*, the total firms listed on the OSE, and the number of firms listing and delisting each year is provided by *Oslo Børs Informasjon* AS (OBI). Total bankruptcies are taken from the *Statistical Yearbook of Norway*.

Year	Total Firms listed on the OSE	Bank relationships Started	Bank relationships Terminated	Total bankruptcies across all firms	Delistings from the OSE
1980	109	5	5	765	10
1981	112	2	1	810	2
1982	117	3	4	955	1
1983	136	5	5	1,236	2
1984	158	7	5	1,304	0
1985	159	6	1	1,340	6
1986	154	17	16	1,426	12
1987	143	14	10	2,075	15
1988	129	18	12	3,891	17
1989	130	11	6	4,536	11
1990	114	14	7	3,814	24
1991	117	14	9	4,926	11
1992	121	16	5	5,749	7
1993	125	10	4	5,158	12
1994	131	14	5	3,634	11
1995	133	10	6	3,500	18
Mean	129.5	10.4	6.3	2,820	9.9

TABLE 2. DISTRESS EVENTS AND NUMBER OF RELATIONSHIPS PER DISTRESSED BANK.

CBGF: Commercial Bank Guarantee Fund. NOK: Norwegian *Kroner* (1 US$ is approximately 7.5 NOK). OSE: Oslo Stock Exchange. SBGF: Savings Bank Guarantee Fund. *Dagens Naeringsliv* is a daily business newspaper. *Kredittilsynet* is the Norwegian Banking Insurance and Securities Commission. *Norges Bank* is the Norwegian Central Bank.

Distress Date	Distress Event (Information Source)	Number (percentage) of firms with a relationship with **distressed** bank(s)			Number (percentage) of firms with a relationship with other banks		
		Year -1	Year 0	Year +1	Year -1	Year 0	Year +1
03/18/88	**Sunnmørsbanken** must turn around losses in order to sustain operations (OSE).	3 (2.3)	3 (2.4)	1 (0.9)	130 (97.7)	122 (97.6)	112 (99.1)
10/08/89	*Kredittilsynet* reports that **Sparebanken Nord-Norge** has lost its capital. SBGF and *Norges Bank* provide guarantees and loans (SBGF 1989 Annual Report).	1 (0.8)	2 (1.8)	1 (0.9)	124 (99.2)	111 (98.2)	110 (99.1)
12/11/90	Report about financial problems at **Fokus Bank** appears in *Dagens Naeringsliv*. Fokus neither acknowledges nor denies report (OSE).	10 (8.9)	10 (9.0)	9 (9.0)	103 (91.2)	101 (91.0)	91 (91.0)
12/20/90	**Christiana Bank** makes upward adjustment in loss estimate (OSE).	54 (47.8)	54 (48.7)	47 (47.0)	59 (52.2)	57 (51.3)	53 (53.0)
01/04/91	**Den norske Bank** has made adjustments in loan loss estimate 1990 (OSE).	62 (55.9)	59 (59.0)	60 (56.6)	49 (54.1)	41 (41.0)	46 (43.4)
06/17/91	CBGF endorses applications from **Den norkse Bank** (NOK 938.8m) and **Christiana Bank** (NOK 624.3m) for preference capital (*Dagens Næringsliv*).	96 (86.4)	89 (89.0)	89 (83.9)	15 (13.6)	11 (11.0)	17 (16.1)

TABLE 3. CUMULATIVE ABNORMAL RETURNS, DISTRESSED BANKS

Cumulative Abnormal Returns (CARs) to banks announcing distress. The Oslo Stock Exchange (OSE) market index is value-weighted index of returns on all firms listed on the OSE. The World Market Index (World) is a value weighted (by the US $ value of market capitalization on July 1st, 1987) combination of the value-weighted indices of German, Japanese, UK, and US stocks. For the 6/17/91 event, the CARs for Den norske Bank and Christiana Bank are averaged and treated as one event. For the individual distress events, the p-values reported in parentheses are based on a Wald test that the sum of daily abnormal returns within the event window are zero. The test is distributed $\chi^2(k)$, where k is the number of days in the window. For the Average Across All Events, the p-values are based on a t-test that assumes the returns are i.i.d. across the events.

Bank (Event Date)	Market Index	Event Window			
		(-10,-1)	(0,+10)	(-3,+3)	(-1,+1)
Sunnmørsbanken (03/18/88)	OSE	0.057	0.073	0.067	-0.028
		(0.022)	(0.008)	(0.000)	(0.001)
	World	0.059	0.067	0.070	-0.028
		(0.019)	(0.012)	(0.000)	(0.000)
Fokus Bank (12/11/90)	OSE	-0.031	-0.363	-0.173	-0.148
		(0.199)	(0.000)	(0.000)	(0.000)
	World	-0.037	-0.387	-0.239	-0.192
		(0.129)	(0.000)	(0.000)	(0.000)
Christiana Bank (12/20/90)	OSE	-0.024	-0.061	-0.082	-0.074
		(0.256)	(0.011)	(0.000)	(0.000)
	World	-0.107	-0.074	-0.095	-0.115
		(0.000)	(0.005)	(0.000)	(0.000)
Den norske Bank (01/04/91)	OSE	-0.123	-0.040	-0.124	-0.085
		(0.000)	(0.075)	(0.000)	(0.000)
	World	-0.134	-0.069	-0.108	-0.104
		(0.000)	(0.002)	(0.000)	(0.000)
Christiana Bank (06/17/91)	OSE	0.229	0.000	-0.150	-0.064
		(0.000)	(0.990)	(0.000)	(0.000)
	World	0.260	0.028	-0.120	-0.053
		(0.000)	(0.316)	(0.000)	(0.000)
Den norske Bank (06/17/91)	OSE	0.149	-0.102	-0.303	-0.149
		(0.000)	(0.020)	(0.000)	(0.000)
	World	0.197	-0.067	-0.259	-0.128
		(0.000)	(0.188)	(0.000)	(0.000)
Average Across All Events	OSE	0.013	-0.088	-0.107	-0.088
		(0.808)	(0.290)	(0.097)	(0.011)
	World	0.001	-0.096	-0.112	-0.106
		(0.979)	(0.277)	(0.100)	(0.015)
SUR Regression Across All Events	OSE	-0.024	-0.105	-0.136	-0.096
		(0.561)	(0.015)	(0.000)	(0.000)
	World	-0.036	-0.118	-0.137	-0.116
		(0.370)	(0.005)	(0.000)	(0.000)

TABLE 4. CUMULATIVE ABNORMAL RETURNS, RELATED FIRMS

Cumulative Abnormal Returns (CARs) on an equal-weighted portfolio of related firms' stocks. N is the number of stocks in the portfolio. The Oslo Stock Exchange (OSE) market index is value-weighted. The World Market Index (World) is a value weighted (by the US $ value of market capitalization on July 1st, 1987) combination of the value-weighted indices of German, Japanese, UK, and US stocks. The Firm-weighted Difference Portfolio averages the differences between portfolios of related and unrelated firms. The portfolios are created by first weighting each return by the total number of related firms. For the individual distress events and for the Firm-weighted Difference Portfolio, the p-values reported in parentheses are based on a Wald test that the sum of daily abnormal returns within the event window are zero. The test is distributed $\chi^2(k)$, where k is the number of days in the window. For the average across all events, the p-values are based on a bootstrapped distribution (200 draws) that preserves the cross-sectional error structure of firms sharing a common event.

Banks (Event Date)	N	Market Index	Event Window			
			(-10, -1)	(0,+10)	(-3, +3)	(-1, +1)
Sunnmørsbanken (03/18/88)	3	OSE	-0.070 (0.006)	0.088 (0.002)	0.142 (0.000)	-0.079 (0.000)
		World	-0.063 (0.011)	0.115 (0.000)	0.150 (0.000)	-0.064 (0.000)
Sparebanken Nord-Norge (10/08/89)	2	OSE	-0.179 (0.000)	-0.274 (0.000)	-0.076 (0.019)	-0.256 (0.000)
		World	-0.181 (0.000)	-0.308 (0.000)	-0.102 (0.000)	-0.263 (0.000)
Fokus Bank (12/11/90)	9	OSE	0.011 (0.057)	0.028 (0.001)	-0.019 (0.000)	-0.023 (0.000)
		World	0.015 (0.050)	0.000 (0.972)	-0.066 (0.000)	-0.062 (0.000)
Christiana Bank (12/20/90)	49	OSE	0.015 (0.001)	-0.005 (0.408)	0.021 (0.000)	0.004 (0.187)
		World	-0.036 (0.000)	-0.014 (0.039)	0.011 (0.003)	-0.022 (0.000)
Den norske Bank (01/04/91)	52	OSE	-0.035 (0.000)	0.052 (0.000)	-0.022 (0.000)	-0.016 (0.000)
		World	-0.043 (0.000)	0.033 (0.000)	-0.012 (0.037)	-0.028 (0.000)
Christiana Bank and Den norske Bank (06/17/91)	75	OSE	0.016 (0.000)	-0.004 (0.286)	0.000 (0.812)	-0.010 (0.000)
		World	0.032 (0.000)	0.008 (0.222)	0.015 (0.001)	-0.003 (0.028)
Average Across All Related Firms	169	OSE	0.010 (0.460)	0.013 (0.200)	0.007 (0.260)	-0.005 (0.230)
		World	-0.001 (0.145)	0.013 (0.425)	0.008 (1.000)	-0.014 (0.000)
Firm-weighted Difference Portfolio	6	OSE	0.001 (0.935)	0.017 (0.391)	0.017 (0.565)	-0.014 (0.253)
		World	0.003 (0.863)	0.020 (0.286)	0.017 (0.549)	-0.017 (0.227)

TABLE 5. SUMMARY OF FIRM CHARACTERISTICS, RELATED AND UNRELATED FIRMS

There are 169 related firm observations in the sample. SALES is year-end sales, measured in millions of 1990 Norwegian Kroner (1 US$ equals approximately 7 Norwegian Kr). AGE is measured relative to the founding date of the firm (in years). DEBT is the book value of debt, divided by the sum of year-end market value of equity and book value of debt. CASH STOCK is the ratio of cash and marketable securities to book value of assets. CASH FLOW is the ratio of net operating income and normal depreciation to book value of assets. DURATION is the length of the reported bank relationship with the distressed bank up to March 1988. INTERNATIONAL takes the value of one when a firm maintains a relationship with a Non-Norwegian bank and zero otherwise. $ISSUE_{YR=t,t+1}$ equals one if a firm issued debt in years t and t+1, and zero otherwise.

Table 4	Mean	Standard Deviation	Minimum	Median	Maximum
SALES	Kr 2,785.138	Kr 7,210.851	0	Kr 551.077	58,976.552
AGE	57.934	40.027	0	63	149
DEBT	0.559	0.255	0	0.597	0.983
CASH STOCK	0.183	0.247	0	0.103	1.682
CASH FLOW	0.092	0.111	-0.400	0.099	0.357
DURATION	6.810	3.935	0	7	11
INTERNATIONAL	0.082	0.276	0	0	1
$ISSUE_{YR=-2,-1}$	0.591	0.492	0	1	1
$ISSUE_{YR=-1,0}$	0.526	0.500	0	1	1

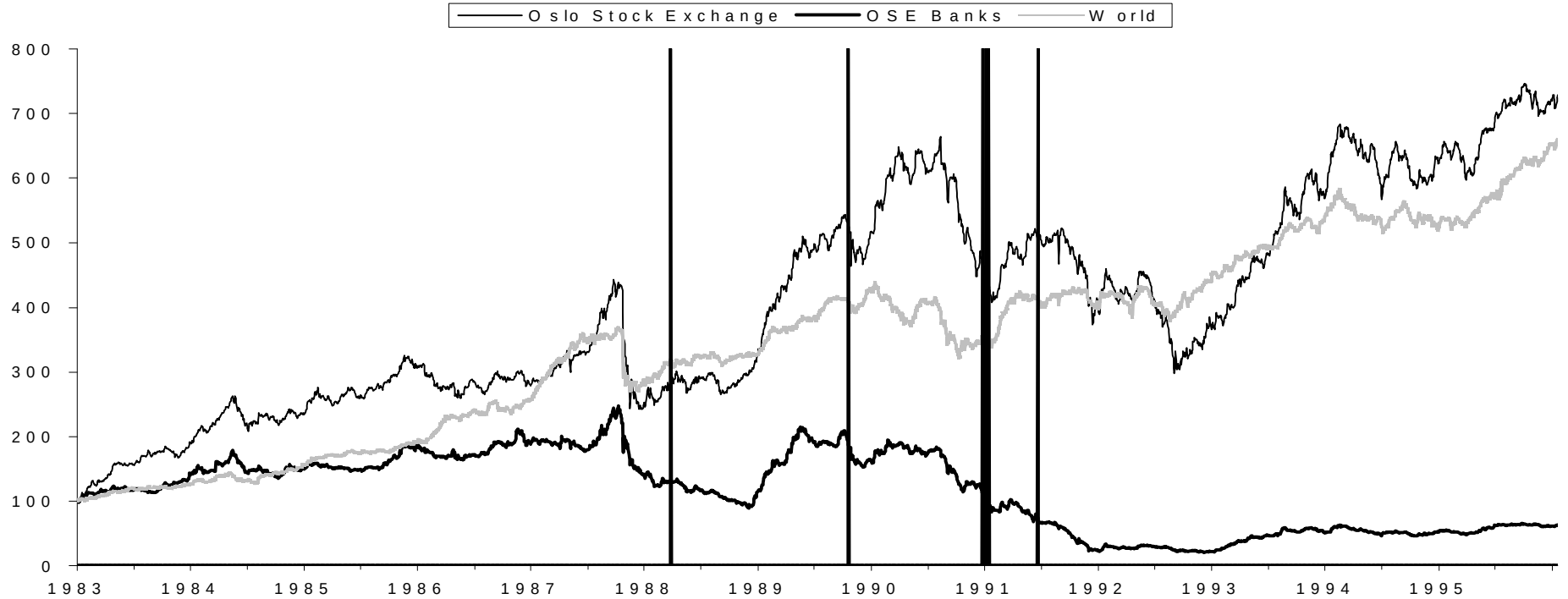
TABLE 6. CROSS SECTIONAL EXAMINATION OF FIRM RELATED CARS

The number of observations is 169. The dependent variable is the three-day Cumulative Abnormal Return for the firm (in percent). SALES is the logarithm of year-end sales, measured in 1979 Norwegian Kroner. AGE is measured relative to the founding date of the firm (in years) at the beginning of the crisis in 1988. DEBT is the book value of debt, divided by the sum of year-end market value of equity and book value of debt. CASH STOCK is the ratio of cash and marketable securities to book value of assets. CASH FLOW is the ratio of net operating income and normal depreciation to book value of assets. DURATION is the length of the reported bank relationship with the distressed bank (the longest length in case of relationships with two distressed banks) at the beginning of the crisis in 1988. INTERNATIONAL takes the value of one when a firm maintains a relationship with a non-Norwegian bank and zero otherwise. $ISSUE_{YR=t,t+1}$ equals one if a firm issued debt in years t and t+1, and zero otherwise. BANKCAR is the three-day CAR for the bank (in percent). TIME is measured relative to the first distress announcement (in days). Coefficients are listed on the first row in each cell with p-values, based on a bootstrapped distribution (200 draws) that preserves the cross-sectional error structure of firms sharing a common event, reported below in parentheses.

Table 5	(1)	(2)	(3)	(4)	(5)
Intercept	3.443 (0.230)	3.402 (0.230)	-4.365 (0.275)	1.951 (0.335)	2.234 (0.305)
SALES	-0.028 (0.470)	-0.076 (0.440)	-0.178 (0.250)	0.005 (0.480)	-0.003 (0.505)
AGE	-0.004 (0.380)	-0.005 (0.345)	-0.007 (0.285)	-0.005 (0.355)	-0.004 (0.365)
DEBT	-0.156 (0.495)	0.274 (0.450)	0.091 (0.465)	0.170 (0.460)	0.058 (0.485)
CASH STOCK	-0.219 (0.470)	-0.018 (0.465)	0.120 (0.485)	0.180 (0.470)	-0.213 (0.470)
CASH FLOW		2.470 (0.315)			
DURATION	0.036 (0.490)	0.044 (0.450)	0.025 (0.500)	0.065 (0.390)	0.066 (0.395)
INTERNATIONAL	-3.056 (0.045)	-3.053 (0.045)	-3.210 (0.040)	-3.285 (0.045)	-3.167 (0.045)
BANKCAR	0.405 (0.105)	0.414 (0.095)	0.432 (0.090)	0.412 (0.105)	0.392 (0.105)
TIME			0.012 (0.095)		
$ISSUE_{YR=-2,-1}$				1.691 (0.160)	
$ISSUE_{YR=-1,-0}$					1.331 (0.215)
Adjusted-R^2	-0.007	-0.013	0.022	-0.001	-0.005

FIGURE 1. MARKET INDICES

The Oslo Stock Exchange (OSE) and the OSE Bank Index are value-weighted (Source: OBI). The World Market Index is a value weighted (by the US $ value of market capitalization on July 1st, 1987) combination of the value-weighted indices of German, Japanese, UK, and US stocks (Source: Datastream). Oil Price (Brent) is the average month ending price of Brent Blend North Sea Crude Oil, in US dollars. % Real GDP growth is the percentage growth rate in GDP, deflated by the Norwegian CPI. % Real Loan Growth is the percentage increase in loans to businesses, households and municipalities by financial institutions, deflated by the Norwegian CPI. % Loan Losses are commercial bank loan losses as a percentage of total commercial bank assets (Source: *The Statistical Yearbook of Norway*).



Oil Price (Brent)	28.80	28.55	27.30	14.50	18.40	15.00	18.40	24.00	19.55	19.30	17.00	15.80	17.05
% Real GDP Growth	1.4	3.5	5.6	2.9	1.7	-1.0	-1.7	1.0	1.4	2.2	2.8	4.1	2.9
% Real Loan Growth	4.8	11.0	14.1	12.7	10.7	3.6	2.8	-1.6	-5.6	-4.1	-3.7	-0.6	2.4
% Loan Losses	0.20	0.27	0.35	0.47	0.99	1.57	1.60	1.96	4.28	2.25	1.41	0.11	-0.25