Salient Crises, Quiet Crises[*]

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Abstract

We construct a new historical dataset of bank equity returns for 46 countries over the period 1870-2016 to examine the role of bank losses and panics in banking crises. Large bank equity declines predict persistent credit contractions and output gaps. These declines capture episodes both with salient crisis symptoms, such as panics, and quieter periods of banking sector distress, allowing us to expand the sample of crises beyond those identified by previous narrative accounts. We find that quiet crises, defined by large bank equity declines without panics, are also associated with substantial credit contractions and output gaps. Large bank equity declines tend to precede panics, when they occur, suggesting that while panics can be an important amplification mechanism, panics are not necessary for the occurrence of severe economic consequences and tend to occur after banking losses are recognized. We use bank equity returns to uncover a number of forgotten historical banking crises and to create a banking crisis chronology emphasizing bank equity losses and failures.

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The severe economic distress faced by the world economy following the 2008 financial crisis in the U.S. has renewed longstanding interest in understanding the nature and macroeconomic effects of banking crises. An important debate, as reflected by presentations and discussions at the 2018 Nobel Symposium on Money and Banking, has emerged regarding whether panic runs on the banking system are necessary for severe banking crises. Bernanke (2018) recently attributes the unusual severity of the Great Recession primarily to the panics in funding and securitization markets, beyond damaged balance sheets of banks and households. Some others have gone even further by essentially saying that banking crises *are* bank panics (Gorton, 2012). An alternative view is that bank losses and private sector balance sheet distress themselves lead to severe recessions, with panics being an amplification mechanism in crises. This raises several important questions: Are panic runs on the banking system necessary for severe banking crises? Or can periods of quiet bank distress without panics translate into severe recessions? Moreover, if panics occur, do they precipitate the crisis, or occur at the final stage of the crisis?

Addressing these important questions requires a systematic sample of banking distress with and without panic runs. However, identifying banking crises is challenging, especially across a broad sample of countries over a long time period. The existing literature, e.g., Bordo et al. (2001), Caprio and Klingebiel (2003), Demirgüç-Kunt and Detragiache (2005), Reinhart and Rogoff (2009), Schularick and Taylor (2012), and Laeven and Valencia (2013), has primarily relied on narrative historical accounts to classify the sample of banking crises and analyze their causes and consequences. As narrative accounts tend to focus on salient crisis symptoms, such as panics and government interventions, this approach may not capture quiet crises without these salient features. Furthermore, the existing narrative-based approach is also subject to other limitations due to the fact that narrative accounts tend to be subjective, qualitative, and backward-looking.[1]

In this paper, we explore a new approach based on bank equity returns. Bank equity returns offer several advantages, being objective, real-time, and quantitative. Our conceptual definition of a banking crisis is an episode in which the aggregate banking sector's ability to intermediate funds is severely impaired. Bank equity is thus also conceptually appealing, as it is a key state variable

[1] To overcome potential biases from these backward-looking accounts, Romer and Romer (2017) construct a real-time measure of financial distress from contemporaneous OECD economic reports for 24 advanced economies starting in 1967. However, OECD narrative accounts, written by outside observers, may still be subjective and miss crises without panics and other salient features, such as Spain's 1977 banking crisis.

in theories of banking crises that determines banks' capacity to intermediate funds from savers to firms and households, e.g., Holmstrom and Tirole (1997) and Gertler and Kiyotaki (2010). As large bank equity declines reflect not only current losses experienced by banks but also the anticipated future losses, they allow us to screen out a sample of banking distress without being confined by narrative accounts.

However, as many other factors beyond banking crises may also cause large fluctuations in bank equity prices, one cannot take for granted the empirical performance of bank equity returns in identifying crises and predicting subsequent economic outcomes. So far, the lack of historical bank equity returns for a large set of countries has prevented systematic study of this important issue. This paper addresses this gap by constructing a new historical dataset on bank equity index returns for 46 advanced and emerging economies going back to 1870, built in large part from hand-collected individual bank stock price and dividend data from historical newspapers. We control for broader stock market conditions by also constructing new indexes for nonfinancial stocks over the same sample. Our dataset thus provides nearly 4000 country-years of information on bank equities, nonfinancial equities, and macroeconomic variables. We also collect new information on the occurrence of events such as panic runs by depositors or other creditors, bank failures, and government intervention, backed by over 400 pages of narrative documentation.

We first confirm that bank equity declines contain useful information about banking sector distress and the economy by testing whether bank equity index returns have predictive content for future macroeconomic dynamics, beyond the information contained in nonfinancial equities. We find that bank equity declines predict persistently lower output. For example, a decline in bank equity of at least 30% predicts 3.4% lower output after three years. At the same time, bank equity declines predict sharp and persistent contractions in bank credit to the private sector. Three years after a bank equity decline of at least 30%, bank credit-to-GDP declines by 5.7 percentage points, relative to periods without a decline. The relation between bank equity returns and future output and credit growth is highly nonlinear: declines in bank equity predict future output and credit contraction, whereas increases in bank equity do not predict stronger economic performance. These estimates control for nonfinancial equity returns, which capture investor expectations about broader macroeconomic conditions. In contrast, while nonfinancial equity declines also separately predict lower GDP, they have no relation to subsequent bank credit-to-GDP. Large bank equity

declines thus likely pick up episodes when output contracts in part due to troubles in the banking sector.

We define "banking distress" as bank equity declines of over 30% in a year and then separate these bank equity declines into "panic" versus "quiet" (non-panic) episodes based on a systematic reading of the narrative evidence for each of these episodes. While some of the "quiet" bank equity declines might be driven by equity market noise, we show that many are well-documented episodes in which the financial system suffered major losses and was deeply undercapitalized, yet strong regulatory forbearance, implicit government guarantees, or outright government intervention prevented panics from emerging among bank creditors.

Our analysis finds that while panic crises tend to be followed by greater credit contractions and lower output growth, quiet crises also predict substantial credit contractions and output drops. For example, even without any narrative account of panics, a decline in bank equity of at least 30% predicts that after three years, bank credit-to-GDP declines by 3.4% and output declines by 2.9%. In contrast, panic episodes *without* crashes in bank equity are not associated with significant subsequent declines in either output or bank credit, confirming that narrative accounts may pick up minor panics without substantial economic consequences. Our finding suggests that in a large historical sample, panics are not necessary for severe economic consequences, as quiet crises can also lead to substantial credit contractions and output drops. In fact, among banking crises defined by narrative-based approaches, roughly 30% of them do not feature panics—a surprising fact considering that many regard panics as the defining feature of banking crises. To stress their relevance, we highlight several prominent episodes of severe non-panic bank distress, including Canada during the Great Depression, the U.K. in 1974, Spain in 1977-1982, the U.S. in 1990-1992, and Japan in 1990-1996 and 2001-2003, among many other examples.

One important advantage of bank equity returns is that they allow for precise analysis of the turning points of historical crises and the dynamics of how crises evolve, as understood in real-time by equity investors. We thus zoom in on a sample of crises to examine the timing of large bank equity declines relative to panics. Using monthly data on over 100 crises, we find that large bank equity declines tend to precede panics and credit spread spikes. On average, panics, as identified by narrative accounts, occur 9 months *after* bank equity has already declined by 30%. Moreover, prior to the month of the panic, bank equity has declined by an average of 35% from its

previous peak. This suggests that substantial bank losses are already present at the early stages of these crisis episodes rather than these losses being due to the panics.

We also examine the relative timing of bank equity versus other crisis indicators around these banking crisis episodes. Bank equity tends to lead other indicators. In particular, bank equity tends to peak earlier than nonfinancial equity and decline earlier as well, especially in the postwar period and in advanced economies. This finding suggests that many banking crises, especially those in postwar advanced economies, tend to originate with losses specific to the banking sector (due to narrow but highly-concentrated exposures, e.g., subprime mortgage-backed securities in 2008) that may be initially neglected, as argued by Gennaioli and Shleifer (2018), and are later transmitted to the broader economy, rather than through the reverse direction.

Taken together, our findings paint a more complete picture of the roles played by bank equity losses and panics during banking crises: Large bank equity declines tend to be followed by severe economic consequences even without panics; large bank equity declines precede the occurrence of panics; and panics with large bank equity declines tend to have the most severe credit contractions and output drops. These findings highlight panics as an amplification mechanism, albeit not a necessary condition of severe banking crises. Furthermore, these findings reinforce the importance of timely recapitalization of bank capital during early phases of banking distress in order to backstop any subsequent panics.

Lastly, in order to facilitate future studies of in-sample characteristics of banking crises, we provide a new chronology of banking crises defined by large aggregate bank losses and bank failures. As there is no single correct definition of a banking crisis, our goal is to provide one possible construction of clear-cut crisis episodes based on systematic criteria emphasizing bank equity losses and failures, characteristics we have shown to be macroeconomically relevant. Importantly, our approach also removes spurious episodes and minor panic episodes, of which there are many, from previous narrative-based approaches. With the help of large bank equity declines as a screening tool, we also uncover a number of “forgotten” historical banking crises that are confirmed by new narrative evidence.

Our paper is organized as follows. Section I discusses conceptual issues. Section II describes our new historical dataset. Section III presents the results on the informativeness of bank equity returns for macroeconomic outcomes. Section IV explores the macroeconomic implications

of panic and quiet crises. Section V compares the timing of bank equity declines, panics, and other crisis indicators around banking crises, and Section VI presents our revised banking crisis chronology.

I. Conceptual issues

A. Theories of crises

One can loosely classify existing economic models of banking crises into three groups based on the roles served by panics. The first group emphasizes panics as a key mechanism that leads to banking crises. Diamond and Dybvig (1983) develop a classic model, which shows that panics in the form of self-fulfilling multiple equilibria can lead depositors to run on a fundamentally solvent but illiquid bank. This model has greatly influenced the views of economists and policymakers about banking crises. It has even motivated some studies to simply define banking crises by bank runs, as reflected by the following comment of Gorton (2012): "All financial crises are at root bank runs, because bank debt—of all forms—is vulnerable to sudden exit by bank debt holders."

The second group highlights coordination failure during panic runs as an amplification mechanism that exacerbates the effects of adverse fundamental shocks that lead to initial bank losses. Goldstein and Pauzner (2005) develop a static model of bank runs, in which bank fundamentals are not perfectly observable, while He and Xiong (2012) provide a dynamic model, in which bank fundamentals are publicly observable and fluctuate over time. In both of these models, inability among depositors to perfectly coordinate their run decisions cause the bank to fail after initial adverse shocks push the bank's fundamentals below a threshold, even though the bank is solvent in the absence of the depositor runs.

The third group focuses on the capacity of banks to intermediate firms' financing needs with household savings, which is typically determined by bank capital, e.g., Holmstrom and Tirole (1997), Gertler and Kiyotaki (2010), He and Krishnamurthy (2013), Brunnermeier and Sannikov (2014), and Rampini and Viswanathan (2018). According to these models, adverse shocks may impair bank capital and constrain banks' capacity to service the economy. Thus, even without any panics in the financial system, quiet bank losses may also lead to substantial economic

consequences. The different roles attributed by these three groups of crisis models to panics motivate our analysis of historical banking crises.

B. Defining crises

Traditional approaches in the literature identify discrete episodes as banking crises based on the presence in narrative accounts of salient features such as bank runs, bank failures, and large-scale government interventions, e.g., Bordo et al. (2001), Caprio and Klingebiel (2003) Demirguc-Kunt and Detragiache (2005), Laeven and Valencia (2013), Reinhart and Rogoff (2009), and Schularick and Taylor (2012). Romer and Romer (2017) point out that because narrative-based approaches are subjective and retrospective, they may contain a look-back bias that leads to an overstatement of average banking crisis severity. Other drawbacks include the treatment of crises as discrete episodes (when a continuum between "normal recessions" and banking crises might be a more accurate representation) and the lack of quantitative measures to distinguish between minor versus major crises. These various narrative approaches also greatly disagree with each other about which episodes are regarded as banking crises. Table 1 highlights this disagreement in the case of Germany, while Table A1 shows this problem across all countries.[2] This strong disagreement is due in part to a lack of a consistent definition of which features constitute a banking crisis. To make matters worse, these approaches (with the exception of Laeven and Valencia, 2013) have minimal documentation, making it difficult for other researchers to reconcile these differences or even to assess the basic facts of what happened during each crisis.[3]

The general approach of this paper is to capture banking crises as times of large bank equity declines. This approach is motivated by a broad class of theoretical models of constrained financial intermediaries, in which a large decline in banking sector net worth constrains banks' ability to lend, e.g., Holmstrom and Tirole (1997), Gertler and Kiyotaki (2011), He and Krishnamurthy (2013), Brunnermeier and Sannikov (2014), and Rampini and Viswanathan (2018). Furthermore, due to the forward-looking nature of equity prices, bank equity declines not only reflect banks'

[2] Jalil (2015) discusses this disagreement among narrative chronologies in the case of U.S. pre-1929 banking crises.

[3] Reinhart and Rogoff (2009) and Caprio and Klingebiel (2003) write only a few sentences about each crisis, while Bordo et al. (2001)'s database only presents macroeconomic variables. Schularick and Taylor (2012) do not provide publicly-available documentation to support their chronology; in personal correspondence, the authors say their chronology is constructed by surveying country-specific experts in banking history in 17 countries.

current losses, but also their future losses anticipated by equity markets based on the best information available in real-time.[4]

Our approach has several important advantages. First, bank equity returns provide an objective, quantitative, real-time, and theoretically-motivated measure, overcoming the aforementioned concerns of the narrative-based approaches. As we will show, bank equity has strong forecasting power for macroeconomic consequences, both in terms of the magnitude of the prediction and signal-to-noise ratio.[5] Furthermore, it does not rely on observing salient features like policy interventions or panics, which are likely to occur only during the most severe crises.

Second, bank equity returns allow us to uncover the full spectrum of banking crises. This includes episodes with clear signs such as panics or bank failures, but also quiet crises (i.e. episodes of large banking sector losses without panics) and banking crises with quick recoveries, both of which may be missed by existing narrative-based approaches. In the case of quiet crises, large bank equity declines are able to identify episodes of large bank losses that do not lead to panics, which are usually due to regulatory forbearances, implicit creditor guarantees, and forceful government intervention. Nevertheless, the banking sector might be severely impaired in its ability to lend. Narrative-based approaches often miss such episodes due to the difficulty of detecting banking losses in the absence of salient characteristics such as depositor runs, as acknowledged by early studies that use narrative methodologies (Caprio and Klingebiel, 1996, 2003).

Third, bank equity price and dividend data are readily available over much of our sample, covering 46 countries over the period 1870-2016. This abundance of data is due to the fact that, in the 19th and early 20th centuries, bank stocks were highly prominent, featured in newspapers and traded as much as railroad stocks. Despite many people's assumptions to the contrary, from 1870 to the 1930s, an era with many historical banking crises, nearly all the major commercial banks in all the countries in our sample were publicly-traded joint stock banks (the only exception being

[4] Another approach might be to use banks' book equity values or the share of nonperforming loans. However, book values and nonperforming loan measures are often slow to recognize losses. In historical balance sheet data, banks rarely, if ever, recognize any losses, even during major crises like the Great Depression.

[5] To explore the signal-to-noise properties of bank equity returns, Figure A1 shows that bank equity returns provide the best real-time signal of banking crises identified from existing narrative classifications, relative to a host of other variables including nonfinancial equity returns, credit spreads, and macroeconomic conditions. Specifically, bank equity declines best *coincide* with banking crises identified from existing classifications in terms of the signal-to-noise ratio (i.e. a higher "true positive" rate for a given "false positive" relative to other indicators). 57% of crises identified by narrative-based approaches involve a bank equity crash of at least 30% in the year of the crisis or in adjacent years.

the U.S., where banks were not widely traded until the mid-1920s). We are thus able to gather their stock prices and dividends from historical newspapers in each country.

At the same time, there are several potential concerns about using bank equity returns to identify crises. First, bank equity returns may contain equity market "noise." To help overcome this concern, in our analysis of how bank equity returns predict economic outcomes, we use nonfinancial equity returns to control for broad stock market fluctuations due to market "noise" or aggregate fluctuations affecting the entire stock market. Second, the prior literature has shown that returns from bond markets have predictive power for macroeconomic conditions (e.g., Gilchrist and Zakrajšek, 2012; Philippon, 2009). It is thus not clear that equity prices are more informative than bond prices. However, as bank creditors have higher cashflow priority than equity holders and are often better protected by regulators in the event of bank losses, bank equity tends to be more sensitive to future economic conditions, especially at the start of crises. Consistent with this basic notion, we show evidence that bank equity declines predict banking crises ahead of bond market distress. In addition, bank equity returns are available for a larger sample of countries and time periods, while corporate and interbank spreads are relatively limited historically.[6]

II. Data

A. Measures of bank equity declines, credit spreads, and macroeconomic outcomes

We now describe how we gather and construct the historical database used in our analysis. We discuss, in turn, the following types of variables: bank and nonfinancial equity total returns, bank and nonfinancial credit spreads, and macroeconomic variables. All variables are annual (except those noted as monthly variables) and form an unbalanced country panel across 46

[6] Bond markets in many countries have only been developed in recent decades. In the postwar period, corporate bond markets mainly existed in the U.S. and U.K., while in most non-Anglophone advanced economies, corporate bond markets were very limited or non-existent until deregulation in the 1980s (as corporate credit was channeled mainly through the banking system). For example, there was only a *single* corporate bond trading in Denmark and Japan before the 1980s (Det Store Nordiske Telegrafselskab and Nippon Telegraph and Telephone, respectively). Even organized interbank markets are a relative recent phenomenon, with data becoming available for most countries starting in the 1990s. As a result, Krishnamurthy and Muir (2017) analyze a more limited sample, since they do not have corporate credit spread data for emerging market countries—or even for many advanced economies (Denmark, Italy, France, the Netherlands, and Switzerland) in the modern period.

countries over the period 1870-2016.[7] The Appendix contains further details on data sources and data construction beyond what is presented here, and Tables B2 through B4 provide a comprehensive summary by country of all data sources used to construct the main variables.

Annual bank and nonfinancial stock returns. We construct a new historical dataset on bank equity prices and dividends for 46 advanced and emerging economies going back to 1870. For each country in the sample, we construct annual (as of December 31 of each year) price return and dividend return indexes for both bank and nonfinancial stocks. The price and dividend indexes in a given country may not necessarily correspond to the exact same underlying banks due to data availability, but they are either market-capitalization-weighted or price-weighted indexes of the broad domestic banking and nonfinancial sectors within each country.[8] Each of these series is pieced together from a variety of sources (documentation and source tables are in the Appendix).[9] We start by collecting premade bank equity indexes from Global Financial Data (mainly price indexes), Datastream (price and dividend indexes), and Baron and Xiong (2017, newly constructed bank dividend indexes).

In addition to using premade indexes, we construct bank equity price and dividend indexes from individual bank and nonfinancial companies' stock prices and dividends. Our main source of new data on individual stocks comes from historical newspapers in each country. From these newspapers, we hand collect prices and dividends on an annual basis for the closing price closest to December 31.[10] Figure 1 provides examples of historical newspapers from Italy (*La Stampa*, 1904), the Netherlands (*De Telegraaf*, 1908), and Germany (*Berliner Boersen-Zeitung*, 1873).

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[7] We exclude country-year observations during major wars. In particular, we drop all countries during the world wars (1914-1918 and 1939-1949), Korea during 1950-53, Spain during 1936-1938, France and Germany in 1870, Mexico during 1910-1920, South Africa during 1899-1902, Japan during 1894-1895, Colombia during 1899-1902, Russia during 1917-1922, and Greece during 1946-1949.

[8] In price-weighted indexes, each stock is normalized to the same par value.

[9] The nonfinancial equity index is constructed to represent a diverse set of important and large companies, mainly covering the following industries: iron steel, goods manufacturing, electrical equipment, textiles, chemicals, paper and pulp products, food suppliers and breweries, and retail. We generally avoid transportation stocks (railroads and shipping), commodity-related stocks (including mining), utilities, real estate companies, and foreign and colonial enterprises, due to their exposure to international factors or their concentrated exposure to real estate.

[10] To give a sense of the sheer number and diversity of historical sources we uncovered, we list the main ones in this footnote (the full list is available in Table B2): *Journal de Bruxelles* for Belgium (1868-1935); *Dagens Nyheder* for Denmark (1868-1909); *De Telegraaf* and *De Standaard* for the Netherlands (1875-1933); *Le Temps* for France (1873-1939); *Berliner Borsen-Zeitung* and *Berliner Morgenpost* for Germany (1871-1933); *La Stampa* for Italy (1865-1934); *Japan Times* for Japan (1897-1915); *Diario de Lisboa* for Portugal (1921-1990); the *Straits Times* for Singapore (1965-1980); *ABC* for Spain (1909-1965); and *Gazette de Lausanne*, *Journal de Genève*, *Le Temps*, and *Neue Zürcher*

Data on individual stock prices and dividends of banks and nonfinancial firms also come from several databases from Yale's International Center for Finance (gathered and made publicly available by William Goetzmann and K. Geert Rouwenhorst) including *Investor's Monthly Manual* data (1869-1934), New York Stock Exchange data (1800-1871), and St. Petersburg Stock Exchange data (1865-1917). Other data on individual stock and index returns are from a variety of additional sources including individual country studies and statistical yearbooks. Additional dividend data for individual bank and nonfinancial stocks is hand-collected from Moody's Banking Manuals (1928-2000) and from individual financial statements of banks accessed at the Harvard Business Library's Historical Collections. We add the bank equity price returns and dividend returns to get bank equity total returns and then adjust by the CPI for each country to get bank equity real total returns. Figure A2 plots the distribution of bank and nonfinancial equity returns around banking crises defined by narrative-based approaches.

The bank equity returns data start around 1870 for advanced economies such as Australia, Austria, Belgium, Canada, France, Germany, Ireland, Italy, New Zealand, Sweden, Switzerland, the U.K. and the U.S. and even for emerging market economies such as Argentina, Brazil, Egypt, Greece, Hong Kong, India, Mexico, Russia, and Ottoman Turkey. To assess the coverage of our bank index, Table B1 reports, for each country and decade, the number of underlying banks used to construct the bank equity return index, or, when premade indexes are available, the source of the premade index. The exact range of included banks varies across countries and historical periods, due to historical data limitations. However, as can be seen both from Table B1 and the associated lists of individual constituent banks, the bank equity index generally contains a broad representation of the largest domestically-chartered commercial banks mainly located in the country's financial center and covering a substantial share of the country's bank assets and deposits. For most countries, our newly constructed bank equity index is based on underlying returns for at least five banks, almost always the largest. It is important to note that the focus on large commercial banks in the country's financial center may lead the bank equity measure to underrepresent banking crises centered on smaller or provincial banks and fail to capture distress

Zeitung for Switzerland (1852-1936). We also collect stock returns data from a variety of additional sources: Argentinian stock returns data (1900-1935) from Nakamura and Zarazaga (2001); Belgian stock returns data from the SCOB database (University of Antwerp, Belgium); Danish stock returns data (1911-1956) from *Denmark Statistical Yearbooks*; Finnish stock returns data (1911-1974) from Nyberg and Vaihekoski (2010); and Swedish stock returns data (1870-1901) from Waldenstrom (2014).

of private banks.[11] As a result, the particular definition of banking crisis in this paper is one mainly focused on large, publicly-traded financial-center commercial banks.

Monthly stock returns and credit spreads for banks and nonfinancials. For episodes on the BVX Crisis List (a list of clearly identified crises emphasizing bank equity losses and failures, as described in Section VI), we also construct *monthly* series in a three-year window around each episode for the following four variables: bank equity index returns, nonfinancial equity index returns, bank credit spreads, and nonfinancial corporate credit spreads. Due to data availability issues, the monthly data is a smaller subset of the larger annual dataset on bank equity returns and only covers around 100 crisis episodes.

For the period 1980-2016, we mainly use Datastream, which covers nearly all 46 countries. For the period 1870-1979, the monthly data is limited to fifteen countries (Argentina, Australia, Belgium, Denmark, France, Germany, Italy, Japan, Netherlands, Norway, Spain, Sweden, Switzerland, U.K., and U.S.) and three-year windows around banking crises, due to the difficulty of hand-collecting monthly data from historical records. In this period, monthly bank and nonfinancial stock prices are transcribed from the historical newspapers listed in the previous section or obtained from other historical sources such as *Investor's Monthly Manual* and Global Financial Data. Bank credit spreads are typically from overnight interbank lending rates, while corporate credit interest rates are from corporate bond yields. We subtract a short-term Treasury bill yield (typically three-month maturity) to get the bank credit spread and a long-term Treasury bond yield (typically 10-year maturity) to get the corporate credit spread. The complete list of sources for both month equity returns and credit spreads for each country is recorded in Table B3.

Macroeconomic variables. To construct real GDP growth, we obtain annual data for each country on nominal or real GDP and the CPI from the Maddison database, the Jorda-Schularick-Taylor macro-history database, Global Financial Data, and the OECD, IMF, and World Bank datasets. The same CPI used to deflate returns is used to obtain real GDP. Data on bank credit-to-GDP comes mainly from the Jorda-Schularick-Taylor database (which goes back to 1870 but for 17 countries only) and from the BIS long credit series for other countries. We supplement these

[11] However, as mentioned, in the period 1870-1939, nearly all the major commercial banks in all these countries were publicly-traded joint stock banks, much more so than even today. (In fact, even most central banks were publicly traded in that period, though we do not include them in our indexes.) The private banks of that period were generally either merchant banks or mortgage banks, not commercial banks.

existing datasets on bank credit-to-GDP with newly transcribed data from: (i) IMF print statistical manuals from the 1940s and 1950s, and (ii) "League of Nations: Money and Banking Statistics" volumes from 1925 to 1939. This allows us to form aggregate bank credit-to-GDP series going back to at least 1918 for nearly all the countries in our sample and back to 1870 for a subset of those. The complete list of sources for each variable is recorded in Table B4.

B. Narrative accounts of crises and the BVX Crisis List

To compare the information contained in bank equity declines with the information content from narrative-based approaches, we construct a list of "Narrative Crises," defined as the union of all banking crises from six prominent papers: Bordo et al (2001), Caprio and Klingebiel (2003) Demirguc-Kunt and Detragiache (2005), Laeven and Valencia (2013), Reinhart and Rogoff (2009, and online update 2014), and Schularick and Taylor (2012, online update 2017). Table A1 reports the Narrative Crisis list. We define the Narrative Crisis date as the earliest reported starting year of each banking crisis across the six papers.

Because our bank equity variable allows us to uncover a number of forgotten crises and remove spurious crises on the Narrative Crisis List, we create a revised banking crisis chronology, which we refer to as the BVX Crisis List. The BVX Crisis List records episodes defined by large aggregate bank losses and widespread bank failures. Details on constructing the new chronology are discussed further in Section VI.

III. Bank equity declines and future macroeconomic dynamics

In this section, we examine the predictability of large bank equity declines for subsequent economic outcomes such as real GDP and bank credit-to-GDP, without being concerned by whether these declines are accompanied by banking crises identified by existing narrative approaches. By showing that large bank equity declines tend to precede severe economic outcomes, this analysis serves to establish that bank equity declines are not simply equity market noise and instead carry important information. It thus justifies our use of large equity declines to analyze banking crises.

A. Real GDP and credit dynamics around bank equity crashes

As an initial exploration of the data, we start by examining how real GDP and bank credit-to-GDP evolve around bank equity crashes compared to times without crashes. Our definition of a "bank equity crash" is an annual bank equity decline of more than 30%. In our full sample, there are 263 country-years with a 30% bank equity crash and 209 when we restrict the sample to observations with non-missing GDP growth, credit-to-GDP, and nonfinancial equity returns.

Figure 2 presents an event study around these bank equity crashes. We compute the average cumulative change in log real GDP and credit-to-GDP around bank equity crashes relative to five years before the crash. Year t=0 is defined as the year of the bank equity crash. For reference, we also plot the average dynamics around normal times, defined as years without a crash. Panel A in Figure 2 shows that, in the years leading up to a bank equity crash, GDP growth is similar to growth in normal times. However, in the year after the crash growth slows sharply, opening an output gap of 4%, which persists even five years after the crash.

In contrast to real GDP, credit-to-GDP expands rapidly in the run-up to bank equity crashes. On average, credit-to-GDP expands by 8.3 percentage points in the five years preceding a crash, relative to 5.1 percentage points during other periods. This pattern is consistent with the evidence in Baron and Xiong (2017) that credit expansions predict bank equity crashes and shows that this result holds for a broader and longer sample. After the crash in bank equity, credit-to-GDP stops expanding and starts declining. This event study thus provides preliminary evidence that bank equity crashes are preceded by credit booms and followed by contractions in output and bank credit-to-GDP.

B. Bank equity declines and future GDP growth

We next examine the predictability of large bank equity declines for subsequent GDP growth more formally. To flexibly estimate such predictability and explore potential nonlinearities, we estimate the following Jordà (2005) local projection specification for horizons h=1,…,6:

$$\Delta_{\mathrm{h}} y_{i,t+h} = \alpha_i^h + \sum_j \beta_j^h \, 1[r_{i,t}^B \in B_j] + \sum_j \delta_j^h \, 1[r_{i,t}^N \in B_j] + \Gamma^{\mathrm{h}} X_{i,t} + \varepsilon_{i,t}^h, \qquad (1)$$

where $\Delta_{\mathrm{h}} y_{i,t+h}$ is real GDP growth from year *t* to *t+h*, α_i^h is a country fixed effect, and $1[r_{i,t}^B \in B_j]$ is an indicator variable for whether the bank equity return in year t is within a range defined by bin B_j. The indicator $1[r_{i,t}^N \in B_j]$ is similarly defined but for nonfinancial equity returns. To examine

the predictability across the full distribution of returns, we include eight evenly-spaced bins, B_j, for both bank and nonfinancial returns: less than -45%, -45% to -30%, -30% to -15%, -15% to 0%, 0% to 15%, 15% to 30%, 30% to 45%, and greater than 45%. The omitted bin is the 0% to 15% range, which we think of as returns during "normal" times.

Equation 1 controls for contemporaneous (*t-1* to *t*) and lagged real GDP growth and the bank credit-to-GDP change, as well as lags of the bank and nonfinancial equity return bins, captured by $X_{i,t}$. We include three annual lags for all variables, but the results are not sensitive to the lag length. Our baseline specification does not include year fixed effects to exploit time series variation within countries. However, we include year fixed effects in robustness tests. Standard errors are double-clustered on country and year, which corrects for serial correlation in $\varepsilon_{i,t}^{h}$ that mechanically arises from overlapping observations at horizons $h > 1$ and residual correlation across countries induced by common shocks. Relative to the traditional VAR framework, the advantage of the local projection method is that it is robust to misspecification and allows for the estimation of nonlinearities and state-dependent responses, as argued by Jordà (2005).

The key parameters of interest are the sequence of local projection impulse responses $\{\beta_j^h\}$ for each bin j, which capture the predictability of bank equity declines after controlling for nonfinancial returns and current and lagged economic conditions. Note that after controlling for contemporaneous nonfinancial returns, bank equity declines reflect shocks from two sources. First, they may reflect banks' loan losses in the current period. Second, as equity prices are forward-looking, they may also reflect the stock market's anticipation of banks' losses in future periods. Thus, the impulse responses capture not only the impact of banks' current losses on the broad economy, as a result of the banks' reduced capacity to lend to firms and households, but also the anticipated interactions between future economic downturns and future bank losses. For the purpose of our analysis, it is not particularly important to isolate these two effects.[12] It is important to note that bank equity is probably also informative for reasons other than a banking channel: for

[12] A more nuanced question is why bank equity declines contain information content about the broad economy not captured by contemporaneous nonfinancial equity returns, which are supposed to reflect all information available about nonfinancial sectors. We can think of at least two possible mechanisms. First, banks tend to provide credit to households and small firms, which may not be fully represented by equity returns of nonfinancial firms. Second, stock market participants may not immediately recognize the full consequences of banking sector losses for the broad economy. The finance literature has offered extensive evidence that stock prices may often underreact to public information. For example, Baron and Xiong (2017) show that stock prices do not fully reflect risks brought by banks' credit expansions.

example, bank equity declines may also reflect the macroeconomic consequences of household balance-sheet distress, as households are on the other side of bank lending.

The left plot in Figure 3 Panel A depicts the cumulative response of real GDP to bank equity return innovations. Relative to "normal times" (0% to 15% returns), declines in bank equity of greater than 45% predict 3.6% lower output after three years. Note that Equation 1 simultaneously estimates the responses to changes of both bank and nonfinancial equities, so that the response plotted on the left side of Panel A is the additional response to bank equity returns over-and-above the response to nonfinancial equity returns (which is plotted in the right side of the panel). This negative effect is highly persistent, translating into a permanent loss in output after 6 years of about 3%. More moderate but still substantial shocks of -30% to -45% are followed by 2.5% lower output after 3 years, with some subsequent recovery. In contrast, smaller negative shocks of -15% to 0% and positive shocks lead to weaker effects on future GDP.

The strong impact of large *negative* bank equity returns but weaker impact of *positive* returns provides evidence that shocks to bank equity have nonlinear predictive content for the real economy. This nonlinear relationship between bank equity distress and output growth is consistent with models of constrained intermediaries such as He and Krishnamurthy (2013), and highlights the advantage of bank equity returns as a continuous measure of banking sector distress. Interestingly, Romer and Romer (2017) find no evidence of nonlinearity between a continuous narrative measure of financial distress and subsequent output.

The right plot in Figure 3 Panel A shows the GDP response to nonfinancial equity shocks. Not surprisingly, larger declines in nonfinancial equity predict lower subsequent output. In contrast with bank equity returns, there is less evidence of nonlinearity in the predictability of nonfinancial equity returns. The ability of nonfinancial equity returns to predict future GDP growth is consistent with Stock and Watson (2003) and justifies nonfinancial equity returns as a suitable control for shocks to the broad economy.

Table 2 presents the regression version of Figure 2 at the 1- and 3-year ahead horizons. For expositional purposes, we replace the eight return bins with an indicator variable for whether there is a bank equity crash, $1[r_{i,t}^{B} \leq -30\%]$, which is defined by an annual return below -30%:

$$\Delta_{\mathrm{h}} y_{i,t+h} = \alpha_i^h + \gamma_t^h + \beta^h 1[r_{i,t}^{B} \leq -30\%] + \delta^h 1[r_{i,t}^{N} \leq -30\%] + \Gamma^{\mathrm{h}} X_{i,t} + \varepsilon_{i,t}^h \quad (2)$$

We report results with and without including the year fixed effects γ_t^h. In Table 2 Panel A, a bank equity crash of at least 30% is associated with a decline in real GDP of about 2.6% after one year (column 2) and 3.4% after three years (column 5), with the estimated coefficients being statistically significant. A crash of 30% in nonfinancial equity also predicts significant and persistently lower real output, and the magnitude is similar to the impact of a bank equity crash.

C. Bank equity declines and future bank credit growth

Why do bank equity declines predict lower future GDP growth, even controlling for nonfinancial equity returns? In this subsection, we show that bank credit to the private sector, i.e., the bank lending channel, may play a key role.

Figure 3 Panel B presents estimates of Equation 1 with the change in bank credit-to-GDP as the dependent variable. The left plot shows that, after 6 years, a bank equity decline of over 45% predicts a 12-percentage point decline in credit-to-GDP, controlling for nonfinancial equity. Declines of between 30% and 45% also predict sizeable credit contractions, amounting to a credit-to-GDP decline of 8 percentage points after 6 years. Table 2 Panel B presents the regression version of Figure 2 Panel B using the 30% bank equity crash indicator. It shows that the decline in credit-to-GDP following a bank equity crash is statistically significant and robust to including controls.

Figure 3 Panel B also shows that the response of credit-to-GDP to bank equity return shocks is highly nonlinear. Large declines in bank equity are followed by sharp credit contraction, but smaller declines (0% to -15%) and increases in bank equity are followed by muted changes in bank credit. This nonlinearity in credit growth is again consistent with models in which banks are financially constrained. Larger shocks to bank net wealth are more likely to force banks against their capital constraint and therefore to contract the asset side of their balance sheet.

The right plot in Figure 3 Panel B presents the credit-to-GDP response to nonfinancial equity shocks. There is a striking contrast between bank equity and nonfinancial equity shocks. Nonfinancial equity shocks have essentially no predictive content for future credit-to-GDP. Even large declines or increases in nonfinancial equity returns have no impact on the subsequent credit-to-GDP ratio. This sharp contrast provides one potential explanation for why bank equity shocks matter for future growth, even after we control for nonfinancials. Bank equity declines likely

capture shocks to bank net wealth, which translate into a credit-supply contraction that may depress household consumption, corporate investment, and production.

D. Robustness and subsamples

The strong relation between bank equity crashes and subsequent output and credit contraction is highly robust to alternative specifications. Appendix Figure A3 shows that the results in Figure 3 are quantitatively similar when including year fixed effects to control for global shocks. Figure A4 explores an alternative timing in which bank equity returns impact real GDP and credit-to-GDP in the same year. Since bank equity returns are correlated with GDP growth, this specification implies that bank equity crashes are associated with even larger output and credit contractions. Panel A in Figure A5 shows that a simpler specification with just a single indicator variable for 30% bank equity crashes (as in Table 2) predicts persistent output gaps and credit-to-GDP contraction. Panel B presents another alternative specification showing the responses to *continuous* innovations in bank and nonfinancial equity returns, rather than using indicator variables. This specification assumes a linear relation between innovations to returns and subsequent outcomes. Panel B shows that shocks to both bank equity and nonfinancial equity predict higher subsequent growth. Interestingly, the magnitudes of the responses are similar. The right plot shows that only bank equity returns predict future credit-to-GDP. Again, nonfinancial equity returns have no predictive content for subsequent credit-to-GDP.

Figure A6 and Table A3 estimate the responses to 30% bank and nonfinancial equity crashes for various subsamples. Figure A6 Panel A excludes the Great Depression and Great Recession years. Specifically, we drop years 1927-1937 and 2005-2015 for all countries and find similar estimates to the full sample. Panel B focuses on the prewar sample and finds more modest effects of bank equity crashes on both real GDP and credit-to-GDP. In contrast, Panel C shows that effects are stronger in the postwar period. The postwar results hold in the Bretton Woods Era (1946-1970, Panel D) and in recent decades (1971-2016, Panel E). The fact that bank equity crashes predict output declines and credit contraction during the Bretton Woods Era, a period without major financial crises according to narrative chronologies, suggests a role of bank equity distress outside of formally-defined banking crises and during normal recessions. We explore this

point further in Section IV. Figure A7 presents estimates for the United States only and finds qualitatively similar results, even when excluding the Great Depression and Great Recession.[13]

As a final test to illustrate the informative content of bank equity returns, we focus on the predictive content of bank equity declines *conditional* on Narrative Crisis episodes. Table A4 shows that the magnitude of the peak-to-trough bank equity decline of each Narrative Crisis episode is associated with the decline in real GDP. The peak-to-trough bank equity decline is also associated with crisis characteristics such as the severity of deposit runs, nonperforming loans, bank failures, and the likelihood of government interventions in various forms to support the banking sector. These findings are not solely driven by general declines in equity markets, as they also hold, albeit not as strongly, when using bank returns in excess of nonfinancial equity returns, as reported in Table A5. See the full discussion in Appendix Section IV. These facts confirm that bank equity returns capture the salient features of banking crises and motivate their use in identifying a broad sample of episodes of banking sector distress, as well as in refining banking crisis chronologies.

IV. Quiet crises

The global financial crisis and Great Recession rekindled a discussion about the role of panics in banking crises. Bernanke (2018), for example, argues that the unusual depth and severity of the Great Recession was caused by the panic in funding and securitization markets that occurred in the fall of 2008 after the collapse of Lehman Brothers, which led to a sharp contraction in credit supply. He argues that distressed bank and nonfinancial private sector balance sheets alone would not have precipitated such a sharp decline in output. On the other hand, there are various historical episodes of banking sector distress that were followed by adverse macroeconomic outcomes but did not involve a panic, as we discuss further in the next subsection.[14] Because bank equity returns

[13] Episodes of 30% annual bank equity crashes capture the most serious episodes of U.S. banking distress, namely years 1907, 1930, 1931, 1937, 1974, 1990, 2007, and 2008.

[14] Caprio and Klingebiel (1996) use the term “silent form of financial distress” and point out that long periods of banking sector insolvency sustained by implicit or explicit guarantees are common in developing countries. “Financial distress of the banking system, when a significant portion of the system is insolvent but remains open, is perhaps the most pernicious type of insolvency. This problem is relatively common in developing and transition economies, where bank runs are averted by explicit or implicit (for example, when the state owns a large segment of the banking sector) deposit insurance. Financial distress can persist for years, overlooked by weak supervisory and regulatory systems and obscured by bankers' ability to make bad loans look good by granting new loans (de Juan 1987). Distress can

allow us to capture a broad spectrum of periods of financial distress, we can compare the macroeconomic consequences of banking distress with and without panics.

A. Bank equity declines versus panics

As in Section III, we estimate the response of real GDP and credit-to-GDP to bank equity crashes. However, this time, we interact bank equity crashes with a "panic" indicator. This specification thus allows us to analyze bank equity crashes without panics ("quiet crises"), bank equity crashes with panics, and panics without bank equity crashes.

To capture episodes of bank distress with and without panics, we systematically go through all cumulative -30% bank equity declines and all Narrative Crisis episodes, classifying each episode as a "panic" or "non-panic." Table A2 provides a summary of our classification. We research each individual episode, drawing both on standard narrative accounts of crises and also new narrative sources (e.g., newspaper articles, research papers, IMF and governmental reports, first-hand accounts), which we carefully document in Appendix Section I.B.

We define a "panic" as an episode containing any of the following criteria appearing in narrative accounts: 1) widespread sudden depositor or creditor withdrawals at several of a country's largest banks, large enough to threaten these banks' ability to stay open; 2) severe and sudden strains in interbank lending markets; or 3) severe and sudden foreign-currency capital outflows from the banking sector.[15] In short, we define panic episodes as an episode when banks experienced sudden salient funding pressures. Our goal is to err on the side of being overly-inclusive in calling episodes a panic and include all potential types of panics.[16] By being overly-

continue indefinitely, but it may progress into overt runs if the public begins to doubt the validity of a government guarantee or the authorities come to recognize the costs of misallocating resources and intervene to restructure or otherwise resolve distressed institutions."

[15] The follow criteria would not, by themselves, be enough to classify an episode as a panic: 1) low or moderate levels of depositor outflows or central bank liquidity support to banks, or 2) a run on a single institution or a handful of small banks.

[16] Our broad definition of a panic is motivated by the fact that traditional depositor runs are rare in modern banking crises and we thus want to capture a broad set of definitions of what modern banking panics look like. Furthermore, traditional runs are difficult to observe directly because banks do not generally report their funding status at daily or weekly frequencies, so we need other characteristics, such as sudden strains in interbank lending markets, to help infer the existence of creditor runs.

inclusive, we ensure that the "non-panic distress" episodes that we are most interested in do not include any of these characteristics.

To examine the consequences of banking sector distress by whether they coincide with a panic, we estimate a macroeconomic predictive regression similar to Equation 2, but now interact the 30% bank equity crash indicator, $1[r_{i,t}^{B} \leq -30\%]$, with an indicator for whether there is narrative evidence of a panic in the year of the crash or the preceding three years. The specification we estimate is:

$$\Delta_{\mathrm{h}} y_{i,t+h} = \alpha_i^h + \beta_1^h 1[r_{i,t}^{B} \leq -30\%] + \beta_2^h Panic_{i,t} + \beta_3^h 1[r_{i,t}^{B} \leq -30\%] \times Panic_{i,t} + \\ + \Gamma^{\mathrm{h}} X_{i,t} + \varepsilon_{i,t}^h, \quad (3)$$

As in Equation 2, Equation 3 also includes a 30% nonfinancial equity crash indicator, along with the standard control variables (country fixed effects, three lags in the bank equity crash, nonfinancial equity crash, panic measure, and the panic measured interacted with the bank equity, as well as contemporaneous and lagged real GDP growth and credit-to-GDP change). We emphasize that estimation of Equation 3 does not provide causal evidence on the effects of panics, but rather provides evidence about whether episodes of non-panic distress are also associated with subsequent downturns. Furthermore, as we define a panic based on narrative information, any selection bias in narrative accounts might inflate the subsequent downturns after panics, but goes against finding substantial downturns after non-panic banking distress.

Impulse responses of real GDP and bank credit-to-GDP are plotted in Figure 4. The responses represent the impact of: (i) non-panic bank equity distress episodes (β_1^h), (ii) panic episodes without a bank equity distress (β_2^h), and (iii) panic episodes with bank equity distress ($\beta_1^h + \beta_2^h + \beta_3^h$).

Figure 4 Panel A shows that both panic and non-panic bank distress predict lower subsequent output and credit contraction, though the magnitudes are stronger for panic bank distress episodes. The corresponding coefficient estimates at the *t+3* horizon are reported in Table 3 Panel A. Non-panic bank distress predicts 2.9% lower output (column 2) and 3.4% lower credit-to-GDP (column 5) after three years, and the estimates are statistically significant. Episodes of panic bank distress are associated with 4.7% lower output (column 2, sum of rows 1-3) and 9.0%

lower credit-to-GDP (column 5, sum of rows 1-3) after three years.[17] While it is not surprising that panic episodes are worse, these estimates suggest that even non-panic distress episodes are associated with deep recessions and persistently tight credit conditions.

Bank equity crashes allow us to pick up periods of banking sector distress that are not associated with headline events such as a bank panic. However, one concern with Equation 3 is that some of the bank equity crashes may reflect equity market "noise" that is not associated with banking sector undercapitalization or tight credit conditions. That is, many of the "quiet crises" may not be banking crises at all, but simply equity market crashes.

To address this concern, we can further refine the set of bank distress episodes into those that also include narrative evidence of widespread bank failures. Widespread bank failures may still occur in the absence of panics due to orderly bank resolutions, e.g., government-directed purchase-and-assumptions, nationalizations, restructurings, or bank closures, all of which we consider bank failures. We again interact bank distress episodes conditional on widespread bank failures with the panic indicator and re-estimate Equation 3. Figure 4 Panel B presents the results, which are also reported in Table 3 Panel B. Once we condition on episodes of bank failures, non-panic distress episodes are as severe as episodes of panic distress. For example, three years after the start of a non-panic distress episode, real GDP is 5.4% (column 2) below the previous trend, compared to 5.0% for panic distress episodes (column 2, sum of rows 1-3). Over the same horizon, non-panic distress predicts a 7.4 percentage point decline in bank credit-to-GDP (column 5), compared to 8.7 percentages points (column 5, sum of rows 1-3) for panic distress episodes.[18]

Figure 4 also analyzes the reverse case: panics without bank equity crashes. The impulse response for these episodes is not statistically or economically different from zero. Thus, panics without bank equity crashes are not associated with any adverse macroeconomic consequences.

[17] For robustness, Figure A8 plots the full nonlinear specification for bank equity return (similar to Figure 2), but excluding all panic episodes, and Table A6 and Figure A9 estimates a specification with continuous bank equity returns. These results reinforce the finding that bank equity distress outside of panic episodes are also associated with weaker macroeconomic performance.

[18] One possibility, raised by the model of Gertler and Kiyotaki (2015), is that low output in non-panic bank distress episodes may partly reflect *anticipated* panics that do not materialize. Anticipated panics that do not occur ex-post can increase bank funding costs, reduce bank net worth, and decrease credit supply. In some settings, explicit government guarantees for distressed banks, including state-owned banks, likely imply that creditors would assign close to zero probability on a panic occurring. In practice, it is difficult to ascertain whether bank creditors assign a positive probability of a panic in our non-panic bank distress episodes. Nevertheless, our results show that banking distress can be associated with adverse macroeconomic outcomes without the occurrence of a panic.

This finding is consistent with Calomiris (2010), who writes that most pre-Depression panics in the U.S. were driven by relatively small fundamental shocks, which created "temporary confusion" but no long-term damage to the banking system or economy. As a result, minor panics without bank equity declines are likely over-represented in narrative chronologies, due to the salience of panics, even though their macroeconomic consequences are mild. On the other hand, bank equity declines without panics are under-represented in narrative chronologies, due to the difficulties of detection, even though the consequences can be quite dire. The resulting bias towards salient but inconsequential panics may actually lead standard narrative chronologies to underestimate the costs of banking crises driven by severe solvency concerns, which we will see in Section VI.

B. Non-panic episodes

We highlight several prominent episodes of non-panic bank distress. A well-known example is the initial stages of Japan's banking crisis (1991-1996). In this phase of Japan's crisis, most of the major banks were thought to be near insolvency, but significant regulatory forbearance and perceptions of strong government guarantees to creditors forestalled a creditor panic. (In general, strong government guarantees characterize many episodes of "non-panic bank distress".) This situation lasted until the fall of 1997, when the collapse of two major securities firms and the Hokkaido Takushoku Bank led interbank markets to seize up, ushering in the panic phase of the crisis (1997-8).

From Table A2, we find that among Narrative Crises, 29.7% of them do not feature panics; among BVX Crises, 20.5% do not feature panics. Examples that did not feature panics include the following well-known historical banking crises: Sweden in 1921-1926, the U.K. in 1974, Spain in 1977-1982, Denmark in 1987-1992, the U.S. in 1990-1992, and the Philippines in 1997-8.

At the same time, we identify many other quiet crises that were *not* previously identified by narrative-based approaches, including:[19]

- Canada during the Great Depression. Although there were no bank panics, and the single bank to fail, Weyburn Security Bank, was tiny, Kryzanowski and Roberts (1993) argue that

[19] Though it is not included on our list of quiet crises, because the bank equity decline is less than 30% in magnitude, the U.S. in 1920-21, in which strong monetary contraction induced waves of bank failures and a large aggregate credit contraction, is an important example too.

the large and widespread bank losses in Canada, as reflected by the large fall in bank stock prices, may help explain the severity of the Great Depression in Canada.[20]

- 1973-5: Many countries experienced bank distress during the global downturn of 1973-5, including Australia, Finland, France, Greece, Hong Kong, Ireland, Italy, Singapore, Switzerland, Turkey, and the U.S., all of which saw large drops in bank equity, both in absolute terms and relative to nonfinancial equity.[21, 22] The recessions in these countries were relatively severe and prolonged, compared to previous postwar recessions.
- 2002-3: Several countries, including Germany, Greece, Israel, Italy, Japan, and Portugal, saw large drops in bank equity, both in absolute terms and relative to nonfinancial equity. In Germany, for example, according to the IMF's financial stability report for Germany in 2003, three out of the four largest German private commercial banks suffered major losses in 2002, and a number of small and medium-sized institutions had to be merged, closed by the regulator or assisted, due to serious difficulties. In Israel, banks suffered large credit losses, with the collapse of Trade Bank and large losses at Discount Bank. In Japan, still recovering from the banking crisis of the 1990s, new problem loans were disclosed across the banking sector; in particular, the government injected 2 trillion yen into Resona Bank, one of Japan's largest banks which was effectively insolvent, and nationalized Ashikaga Bank, a large regional bank.

[20] Kryzanowski and Roberts (1993) note that the large Canadian banks "were insolvent at market values and remained in business only due to the forbearance of regulators coupled with an implicit guarantee of all deposit", both policies being held over from the previous Canadian banking crisis of 1923. The report the largest Canadian bank at the time, the Bank of Montreal, had estimated nonperforming loans in excess of 40%.

[21] Among these non-panic episodes, the banking problems were perhaps the most severe in Australia, which saw a large real estate bust and numerous failures of building societies and small banks between 1974 and 1979 (Fitz-Gibbon and Gizycki, 2001). In Western Europe, countries faced balance-of-payment crises, which impacted the banking sector especially through large foreign exchange losses at banks and tight Eurodollar funding (Coombs, 1973). In particular, Germany's Herstatt Bank failed in 1974, and Germany's Westdeutsche Landesbank and Switzerland's UBS suffered large losses in foreign exchange markets (Schwartz, 1987). In Singapore, the Chung Khiaw Bank, then part of United Overseas Bank, was rumored to be close to bankruptcy.

[22] In the U.S., in particular, there were large aggregate bank losses, widespread symptoms of financial distress, and several prominent failures of large regional banks. Doyran (2016) writes: "Although bank profits subsided in 1974 because of high interest rates and foreign competition, US banks were particularly hard hit by bad loan portfolios, poor regulatory oversight over foreign exchange transactions. inadequate capital (high loan/capital ratio), deficient internal controls and audit procedures, and aggressive expansion through the use of short-term borrowed funds, especially Eurodollar funds, money market CDs and federal funds. In early 1974, a tightened monetary policy surprised banks expecting eased interest rates. This led to short-term borrowing for large real estate projects as many large banks borrowed billions on a daily basis to collateralize short-term loans. When higher interest rates were announced, they suffered enormous losses. The concern over the effects of financial instability increased greatly as regulators reported substantial increases in the number of 'problem banks' under their supervision."

C. Bank equity declines predict macroeconomic outcomes outside Narrative Crises

In this subsection, we ask whether large bank equity declines predict subsequent output and credit contractions even when excluding *all* Narrative Crises from the sample. This analysis serves to strengthen the key message that large bank equity declines represent substantial damage to the banking sector and the economy even in the absence of any banking crisis recorded by narrative chronologies, not just panics. We re-estimate Equation 1, but now exclude country-year observations within a ±3-year window around Narrative Crisis episodes. As before, we control for nonfinancial equity return indicators, along with the standard control variables.

Figure 5 plots impulse responses from local projections for future real GDP and bank credit to GDP. As can be seen in this non-parametric specification, the magnitudes of the real GDP decline are nearly as large outside banking crises as they are in the full sample (Figure 3).[23] Thus, the predictive content of bank equity declines is not simply driven by narrative banking crises but holds nearly as strongly outside them. This finding reinforces the result that episodes of non-panic bank distress are also associated with adverse macroeconomic consequences. Moreover, it suggests that banking sector distress may play an important role in business cycles more generally.

V. Relative timing of bank equity declines, panics, and other crisis indicators

The previous section showed that panics are not necessary for bank equity distress to be associated with output and credit contractions. However, panics may amplify the consequences of banking sector distress. In this section, we examine the timing of bank equity declines relative to the start of panics and other crisis indicators. To do this, we use monthly data around banking crises on the BVX Crisis List to provide an in-sample analysis of the relative timing of bank equity declines, panics, credit spread spikes, and nonfinancial equity declines. This analysis also serves to showcase how bank equity prices can be useful in providing information on the timing and proximate causes of banking crises. Monthly data tell us about the turning points of crises and the dynamics of how crises evolve, as understood in real-time by equity and debt investors. This

[23] Table A7 presents the evidence in tabular form and formally tests differences between the predictive content of bank equity crashes in narrative crisis versus non-crisis episodes.

higher-frequency information allows us to show that large bank equity declines usually precede panics and credit spread increases.

The U.S. 2007-8 banking crisis provides a vivid illustration of the key results, so we start with this case study before showing the results for a broad sample of crises. Figure 6 shows that, for the 2007-8 U.S. crisis, bank equity prices declined substantially before the panic phase of the crisis. Bank equity also detected the impending crisis before credit spreads and nonfinancial equity. Bank equity peaked in January 2007, ten months before the nonfinancial index peak in October 2007; similarly, bank equity cumulatively fell 30% by February 2008, while nonfinancial equity did not do the same until September 2008. Meanwhile, corporate spreads (the AAA-Govt and BAA-AAA spreads) and interbank lending spreads (the LIBOR-OIS spread) relative to baseline levels remained under one percentage point until the panic phase of the crisis in September 2008, a full 21 months after bank equity had started declining.[24] We will show in this section that these patterns also hold true in other historical episodes on the BVX crisis list.

A. Bank equity crashes and panics

Figure 7 presents the dynamics of bank equity prices relative to other crisis measures systematically across all crises on the BVX Crisis List.[25] We focus on a three-year window around the crises on the BVX Crisis List and compute the average evolution of equity indexes and credit spreads. Time 0 in event time is defined as January of the BVX crisis year, and equity and credit spread measures are normalized to zero in this month. In the same figure, we plot the frequency distribution of panics, when these occur, to provide a visual sense of whether panics tend to occur before or after large bank equity declines.[26] Panel A in Figure 7 presents the average dynamics for the full sample, and the remaining panels present results for various subsamples.

[24] Equity and bond prices for Lehman Brothers, whose failure precipitated the panic phase of the 2007-08 crisis, display similar dynamics. Lehman Brothers' stock price saw a gradual but large decline of 67% relative to the S&P 500 from its peak in January 2008 to the week before its bankruptcy in September 2008. In contrast, returns on Lehman bonds were much more stable throughout the spring and summer of 2008. Relative to January 2008, the cumulative abnormal return on Lehman bonds was only -3% one week before its bankruptcy. Lehman Bonds then fell sharply in the week leading up to its bankruptcy (Denison, Fleming, and Sarkar 2019).

[25] Figure A10 presents the same results using crises on the Narrative Crisis list, demonstrating that the results are robust to alternative banking crisis lists.

[26] The starting month of each panic, according to narrative accounts, is reported in Table A2. Appendix I.B links to extensive historical documentation on the onset of panics.

We start by focusing on the relative timing of bank equity declines and panics. The blue line in Figure 7 plots the average dynamics of bank equity returns, and the orange line represents a frequency plot of the first panic month, with the area under this curve normalized to one. Figure 7 shows that on average bank equity falls substantially before the panic phase of the crisis. Panics tend to occur during the crisis year (months 0 to 11 in event time), while bank equity generally peaks and begins declining in the year prior to when the crisis is dated.

Table 4 Panel A analyzes the timing of bank equity declines and panics more formally. Column 1 computes the average number of months between the "bank equity crash" (defined as when bank equity has declined by 30% from its previous peak) and the month of the panic. For example, in the U.S. in 2008, the bank equity crash occurs in February 2008, while the panic occurs in September 2008, giving this episode a value of seven months. On average across BVX Crisis List episodes with a panic, the panic occurs 8.6 months after the bank equity crash. Column 1 also reveals that in 75% of crises for which we have data (67 out of 89), the bank equity crash strictly precedes the panic. In contrast, panics occur before bank equity crashes in only 18% of cases (16 out of 89).[27] This difference is statistically significant based on a p-value calculated under the null hypothesis that the event "bank equity crashes before the panic" is Bernoulli-distributed with parameter 0.50. These results are robust to using the sample of episodes on the Narrative Crisis List, demonstrating that the result is not specific to the BVX crisis list (see Appendix Table A8).

Figure 8 Panel A presents the full distribution of bank equity declines from the previous peak to the month just prior to the panic for the sample of banking crises with panics. On average across BVX Crisis List episodes, bank equity declines by 35% from the peak to the month prior to the panic. Figure 8 Panel B plots the distribution of bank equity decline at the month prior to the panic as a percent of the total peak-to-trough decline. On average across banking crises with panics, bank equity has sustained 57% of its total peak-to-trough decline before the panic occurs. Overall, the evidence shows that panics, when they occur, tend to occur substantially after the crisis has been detected by bank equity and large losses have been realized by bank equity investors. This pattern therefore implies that a non-trivial proportion of bank losses are already present before the panic, suggesting that large banking sector losses are already "baked in" at the

[27] Gorton (1988) finds that panics in the U.S. National Banking Era (1863-1914) typically occurred a few months after NBER business cycle peaks. He argues these panics were due to systematic responses by depositors to changing perceptions of risk, based on the arrival of new information about a coming recession and resulting loan losses.

early stages of the crisis before the panic even starts, rather than caused by the panic. Panics thus tend to represent the final, most extreme phase of a crisis that arises after substantial losses have been realized. This general pattern lends support to the second group of theories discussed in Section I.A, i.e., Goldstein and Pauzner (2005) and He and Xiong (2012), which highlight panic bank runs as an amplification mechanism of initial negative fundamental shocks.

Do bank equity declines pick up crises before or after the crisis dates from previous narrative approaches? Table 4 Panel A shows that bank equity crashes pick up banking crises 2.8 months before the Reinhart and Rogoff (2009) dates and 2.5 months before the *Narrative Crisis* dates (i.e. the earliest date across the six narrative approaches). This calculation uses January as the start of the crisis, as narrative chronologies usually only provide the year of the crisis, so this estimate is conservative. Given that narrative chronologies often date crises based on the year when the panic starts, this provides further support for the result that bank equity declines precede panics. It also suggests that narrative accounts tend to date crises late. This result is consistent with Boyd, De Nicolo, and Rodionova (2019), who show that bank lending contracts before crises are dated.

B. Bank equity crashes and credit spread spikes

What about the relationship between bank equity declines and credit spread increases? Credit spread spikes may be another potential indicator of a panic. Figure 7 shows that, in all subsamples of the data, bank equity falls by large amounts well ahead of the credit spread increases. Both interbank lending spreads (the green line) and corporate credit spreads (the black line) increase after the start of the crisis, while bank equity falls prior to the year of the crisis. The spike in credit spreads tends to coincide with the occurrence of panics (the orange line), suggesting that credit spread spikes proxy for the occurrence of panics. Credit spreads are only available for a smaller subset of crises. Panel B in Figure 7 thus presents the same event study for a consistent sample with non-missing equity measures and bank credit spreads. Panel B confirms that the differences in the timing of bank equity declines and credit spread spikes are not driven by different underlying samples. The fact that bank equity falls first before the spike in credit spreads is consistent with the Merton (1974) model that bank shareholders take first losses while creditors respond only later when banks approach default.

Table 5 reinforces the evidence that bank equity tends to lead credit spreads by showing the distribution of credit spread increases conditional on bank equity falling by a certain amount. For example, Panel A shows that, in a BVX Crisis List episode, when bank equity first falls by more than 30% (row 3), the median credit spread increase is only 55 basis points (bps). In more than 20% of cases, bank credit spreads have not increased at all at this point. Only in 30% of cases has the bank credit spread increased by more than 1 percentage point. For reference, the median trough-to-peak bank credit spread spike across BVX Crisis List episodes is 2.6%.

Panel B in Table 5 presents the results for corporate credit spreads, rather than bank credit spreads. Similar to the results in Panel A, when bank equity first falls by more than 30% (row 3), the median corporate credit spread increase is only 25 bps, and in over 40% of cases corporate credit spreads have not increased at all. For reference, the median of the trough-to-peak corporate credit spread spike across BVX Crisis List episodes is 1.7%.[28]

C. Bank and nonfinancial equity crashes

Figure 7 also explores the timing and magnitude of bank and nonfinancial equity declines during banking crises. Panel A shows that bank equity (the blue line) peaks before nonfinancial equity (the red line) and starts declining earlier. Table 4 Panel B confirms this result by comparing whether bank or nonfinancial equity returns first detect the crisis. As before, we record a bank (nonfinancial) equity crash as the first month in which the index falls a cumulative 30% in real total returns from its peak. Column 1 in Table 4 Panel B shows that, on average, across banking crisis episodes on the BVX Crisis List, bank equity crashes precede nonfinancial equity crashes by a statistically significant average of 1.77 months. Column 1 also shows that bank equity crashes strictly precede nonfinancial equity crashes in 66 of 129 crises, while the opposite happens in 47 cases (and they happen in the same month in 16 cases). As a robustness test, Column 2 in Table 4 Panel B performs the same analysis, but compares the month that the bank equity index peaks,

[28] As a robustness check, Table 4 Panel A compares the timing of 30% bank equity crashes to the timing of credit spreads spikes. We record a credit spread "spike" as the first month in which credit spreads increase at least 1 percentage point above their pre-crisis average levels. Since a 1 percentage point increase is somewhat arbitrary, we present this evidence mainly as robustness analysis confirming the result in Figure 7. Nevertheless, Table 4 Panel A shows that 30% bank equity crashes detect the crisis 3.4 months before a 1% spike in bank credit spreads (column 5) and 4.5 months before a 1% spike in corporate credit spreads (column 7).

relative to the month of the peak in the nonfinancial equity index. On average, the bank equity index peaks 1.15 months before the nonfinancials index and in 56.4% of crises.

The fact that bank equity tends to lead nonfinancial equity in crises is consistent with the view that banking crises originate with shocks to a narrow sector of the economy (e.g., subprime exposure in 2008), leading to banking sector losses, which are then transmitted to the broader economy in part through a bank lending channel. If instead most banking crises were caused by broad macroeconomic shocks that then led to banking sector losses, we would expect nonfinancial equities to decline before or at the same time as bank equity.

Table 4 Panel C shows that bank equity crashes preceding nonfinancial equity crashes is true mainly for post-World War II crises in advanced economies and is often the opposite for prewar crises and emerging market crises. Panels C and D in Figure 7 show the distinction across the pre- and postwar sample graphically. In the postwar period and in advanced economies, bank equity tends to decline before nonfinancial equities, as discussed above. In contrast, in the prewar period and in emerging economies, nonfinancial equities are more likely to crash first. One interpretation of this is that the initial causes of banking crises have changed over time. More recent crises tend to start with distress to highly leveraged banks exposed to a relatively narrow segment of the economy. In contrast, prewar banking crises may have been the result of broader macroeconomic shocks that subsequently translated into losses and distress for banks, consistent with the analysis of Calomiris and Gorton (1991) for pre-Depression crises in the U.S.

Figure 7, along with Appendix Figure A11, also reveals several additional new facts about bank equity around banking crises. First, bank equity falls substantially more than nonfinancial equity conditional on a crisis. This is notable since, unconditional on a crisis, bank equity has a market beta of 0.8 in our sample, so bank equity is actually less volatile than the market most of the time. Second, bank equity declines are “permanent,” in the sense that they do not recover post-crisis, presumably reflecting permanent credit losses, a cash flow effect. In contrast, nonfinancial equities recover after the crisis, suggesting nonfinancial equity declines are mainly driven by a discount rate effect. Third, bank equity declines tend to unfold gradually over several years, with an average peak-to-trough duration of 27.5 months, according to Table 4 Panel B. In other words, in equity prices, there is generally not a sudden “Minsky moment”. This slow decline could potentially reflect a behavioral bias of overoptimistic investors initially underestimating the true

depth of the crisis (e.g., Gennaioli and Shleifer, 2018), or, in a rational framework, the presence of informational frictions making it difficult for investors in real-time to assess the extent of bank losses.

VI. Forgotten crises and the BVX Crisis List

While bank equity declines allow us to screen out a relatively complete set of banking distress episodes with or without salient narrative evidence, some bank equity crashes may be due to equity market sentiment unrelated to banking distress. For some in-sample studies of banking crises, such as the timing analysis on specific events in the previous section, it is therefore useful to create a chronology of clear-cut banking crisis episodes that are free of potential false positives, albeit at the expense of selecting more severe episodes. This section provides details on constructing the BVX Crisis List, which uses bank equity returns along with other narrative information on crises, to refine the existing chronology of banking crises in a systematic way. We also illustrate how bank equity returns can be used to uncover "forgotten" historical banking crises.

There is obviously no single correct definition of a banking crisis, but our goal is to provide one possible construction of clear-cut crisis episodes based on systematic criteria emphasizing bank equity losses and failures. With the data we provide, one can likewise construct alternative lists of crises based on other dimensions we document: e.g., the presence of panics, various forms of government intervention.

In creating such a chronology, we point out that the existing narrative crisis chronologies tend to include a surprising number of historical errors, potentially due to a *"hearsay" bias*. That is, many crisis chronologies call an episode a crisis because previous chronologies do, without actually looking at primary sources or quantitative data. This leads to the perpetuation of historical error or the overemphasis on minor panics. For example, Reinhart and Rogoff (2009) call Italy in 1935 a crisis, because Bordo et al. (2001) considers it a crisis, because, in turn, Bernanke and James (1991) consider it a crisis, though it is unlikely that any banking crisis, however defined, started in 1935.[29] Bank equity declines thus provide an objective criterion to screen crisis episodes

[29] Bernanke and James (1991) consider it a crisis mainly due to a sharp drop in bank credit that year in the League of Nations banking statistics. However, this drop is likely a data artifact, as it is not reflected in the historical balance sheets of Italy's largest banks, which we examined. In fact, the main banking crisis in Italy erupted in 1930 and by 1935 was largely resolved (the entire banking sector had largely been nationalized). The only bank to fail in 1935 was

and thus help us remove a number of spurious episodes, which feature little evidence of any of the features commonly associated with banking crises.

To construct the BVX crisis list, we start with the existing Narrative Crises list. Then, using the data in Table A2, we add new banking crisis episodes by first screening for cumulative 30% decline in bank equity, which may indicate *potential* new banking crises, then only adding the subset of these with clear narrative evidence of widespread bank failures. *Widespread bank failures* is defined as an episode of more than one major bank failing or a substantially higher-than-usual rate of smaller banks failing.[30] Next, we remove crises from the Narrative List by screening for episodes with cumulative bank equity declines of less than 30%, which may indicate *potential* spurious crises, then only deleting those with no narrative evidence of widespread bank failures. The philosophy behind our approach is to be conservative when adding and deleting episodes, only making a change when there is both clear-cut quantitative evidence of aggregate banking sector losses (a bank equity decline) *and* narrative evidence of widespread bank failures.

The resulting BVX Crisis List is presented in Table 6. We date the start of each crisis as the year in which the bank equity index first falls more than 30% from its peak. We also list the bank equity return (i.e. the peak-to-trough real total return) as a measure of the severity of each banking crisis.[31]

We highlight several examples of newly-uncovered crises (episodes added to our BVX Crisis List) and spurious crises (episodes deleted) to showcase some of the improvements of our chronology.[32] The 22 newly-identified crises are marked with an asterisk in Table 6. We discuss two interesting newly-uncovered banking crises below:

Credito Marittimo, which had been nationalized years earlier and was only finally liquidated by the government in 1935.

[30] A "bank failure" is defined broadly to include: forced mergers, restructurings, government equity injections, and nationalizations of nearly failing banks. See the historical documentation for each episode in Appendix Section I.B.

[31] We also revise the starting years of all bank crises (see Table A10 Panel A) to correspond with the initial year of 30% bank stocks crashes. Of course, there are reasons why the narrative accounts date the starting year when they do. With the new dates, our goal is simply to offer additional and alternative information about when markets first recognized the bank equity losses. See Table A2 for a comparison with the Narrative Crisis dates, which in most cases are very similar. Also, on the BVX Crisis List, we occasionally combined several pairs of episodes occurring close together in time (see Table A10 Panel B), when it seems more appropriate to consider them as a single crisis (i.e. when bank equity prices did not show two separate declines and when the narrative evidence on bank failures conveyed a continuous sequence of banking distress across time, not clustered into two phases).

[32] In Appendix Section VI.B and Figure A13, we use these crisis severity measures to analyze episodes from the Great Depression, in which there is some debate about which countries experienced severe banking crises.

- Belgium in 1876. As reported by Grossman (2010): "the boom in Belgium after the Franco-Prussian war led to the establishment of new banks. Several of these failed when the international crisis of 1873 arrived in Belgium. A few smaller banks went into receivership, and the larger Banque de Belgique, Banque de Bruxelles, and Banque Central Anversoise had to be re-organized. Durviaux (1947) calls this a serious crisis, while Chelpner (1943) suggests it may have been less serious." In this episode, the bank equity total return index declined by 56.5%.
- Japan in 1922. This episode is distinct from the Japanese banking crises of 1920 and 1923. Shizume (2012) writes: "Ishii Corporation, a lumber company engaged in speculative activities, went bankrupt at the end of February 1922, triggering bank runs in Kochi Prefecture (in south-western part of Japan) and Kansai region (Osaka, Kyoto and their environs). Then, from October through December 1922, bank runs spread far across the country, from Kyushu (the westernmost part of Japan) through Kanto (Tokyo and its environs in eastern Japan)… The BOJ extended 'special loans' to 20 banks from December 1922 to April 1923." In this episode, the bank equity total return index declined by 40.5%.

We remove 43 spurious banking crises, as listed in Appendix Table A9.[33] Many of these deleted events are typos or historical errors, monetary or currency issues that had only minor effects on the banking sector, or panic episodes that were relatively small (e.g. a few small provincial banks were affected).[34] Three concrete examples of spurious banking crises that we delete are:

- Germany 1977. Reinhart and Rogoff (2009) simply report that "Giro institutions faced problems," though we could not find any independent verification from contemporaneous newspaper accounts of any unusual problems affecting the banking sector at the time. The peak-to-trough bank equity decline was small (-11.7%).

[33] Note that the label "spurious" is just our short-hand for these removed episodes: while many are indeed clear-cut historical errors that plausibly merit the label "spurious", others are simply minor panics that do not reach the threshold of featuring large aggregate bank losses (as measured by large bank equity declines) or narrative evidence of widespread bank failures.

[34] One problem inherent in many older accounts of crises is that the terms "financial crisis" and "panic" are used variously to describe: monetary crises, currency crises, sovereign debt crises, or even just stock market crashes, without being clear about what they are describing. These other types of non-banking-crisis crises often get conflated with banking crises in secondary sources that cite these original historical accounts.

- Netherlands 1893 and 1897. According to Sumner (1896), 1893 was a monetary crisis but did not feature depositor panics or bank failures. There was a large outflow of gold, which necessitated the Netherlands Bank and foreign banks to raise their discount rates to stem the outflow. The discount rate was lowered to normal levels after three months when the gold outflows had subsided. There was no decline in annual bank equity prices. As for 1897, we could not find any reference to a banking crisis, and there was no decline in annual bank equity prices.[35]

We summarize the properties of all the added and deleted episodes in Table 7. This table provides further supporting evidence that the added banking crises are real and the deleted banking crises are minor or spurious. Column 1 shows that the added crises have an average peak-to-trough bank equity decline of 56.3% and an average peak-to-trough real GDP decline of 9.4%. These numbers are greater than the average for all episodes on the BVX Crisis List (column 3), suggesting that these added episodes are truly crises. Column 2 has statistics for deleted crises: an average peak-to-trough bank equity decline of 8.1% and an average peak-to-trough real GDP decline of 2.5%. These numbers are considerably lower than the overall average for episodes from the BVX Crisis List (column 3), suggesting that these deleted episodes are not actually banking crises.

To assess potential biases of the narrative lists, we compare the BVX Crisis List with various narrative crisis lists. Appendix Figure A13 compares the macroeconomic consequences of BVX Crisis List episodes with those from Reinhart and Rogoff (2009) and Laeven and Valencia (2013). Appendix Table A11 likewise compares along various banking crisis dimensions. Compared to Reinhart and Rogoff's list of banking crises, for example, we find the consequences of the BVX Crisis List episodes are actually *more* severe, both in terms of GDP, credit contraction, and characteristics of crises.[36] This result stands in contrast to Romer and Romer's (2017) argument that Reinhart and Rogoff's (2009) chronology overstates average crisis severity due to a

[35] Reinhart and Rogoff (2009) justify this banking crisis by citing Bordo et al. (2001) and Homer and Sylla (1991). However, Bordo et al. (2001) gives no explanation regarding this crisis, and Homer and Sylla (1991) only show in a graph that short-term interest rates were high; Homer and Sylla (1991) do not refer to 1897 as a crisis year.

[36] Similarly, in unreported results we find that the BVX Crisis List episodes are more severe than Schularick and Taylor's (when compared on their sample of 14 countries) and Bordo's, but slightly less severe than Laeven and Valencia's (when compared on their time sample 1970-2012), perhaps because Laeven and Valencia only identify crises that are serious enough to warrant several forms of major government intervention.

"look-back" bias. These results are discussed in detail in Appendix Section VI.D. The fact that the BVX Crisis List is on average more severe is, in large part, due to eliminating many spurious crises from their list.[37]

VII. Conclusion

In this paper, we construct a new historical dataset of bank equity returns for 46 countries going back to 1870 to better understand the nature of banking crises. Large bank equity declines provide a wide range of information to study historical banking crises, in addition to being appealing from a conceptual standpoint. We document that large bank equity declines are a powerful predictor of lower subsequent GDP growth and bank credit-to-GDP, even after controlling for nonfinancial equity returns. The relation between bank equity returns and subsequent macroeconomic outcomes is highly nonlinear, showing that bank equity is particularly informative about severe negative macroeconomic events involving a decline in intermediated credit.

The informativeness of large declines in bank equity allows us to map out a broader sample of crises. These include banking crises with salient characteristics such as panics or major government interventions that have been the focus of narrative approaches, but also "quiet" banking crises when the banking sector is undercapitalized but headline events such as panics are avoided. The ability to pick up a broader sample of events allows us to ask whether panics are necessary for severe macroeconomic outcomes or whether periods of banking sector distress without panics, "quiet crises," are also associated with lower output and credit growth. We find that while large bank equity declines coupled with narrative evidence of panics are followed by the most severe macroeconomic downturns, episodes of non-panic banking distress also translate into non-trivial slowdowns. Moreover, panics, when they do occur, tend to come after substantial bank equity declines, reflecting the fact that major current and expected future losses are already been realized by equity investors.

[37] On the BVX Crisis List, we delete 51 events from Reinhart and Rogoff's list, having an average GDP decline of -2.6%. This small average GDP decline from spurious crises drags the average severity down for Reinhart and Rogoff's crises.

Our results provide new insights into banking crises. They suggest that the defining feature of banking crises are major bank losses. These losses often, though not always, lead bank creditors to run on bank debt, especially once major current and expected future losses have been realized and banks appear sufficiently undercapitalized. However, even when panics are averted, for example by implicit or explicit guarantees, an undercapitalized banking system is still unable to adequately service the private sector. Thus, it is important for regulators to focus on bank solvency in addition to preventing funding pressures and outright panics. Our evidence suggests that simple bank equity measures, in addition to credit expansions and other balance sheet measures, provide a useful barometer of the health of the banking sector.

As a final caveat, we emphasize that while our results provide new insights into the roles of bank losses and panics, we cannot causally identify the role of bank losses and panics in depressing bank lending and output. Our episodes of large bank equity declines capture broad episodes of bank distress and output contraction, but these declines are in part due to weak corporate and household balance sheets, beyond banking sector distress itself. We look forward to future work that attempts to disentangle the causal roles of the bank lending channel, banking panics, and non-financial balance sheet distress.

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Figure 1: Sample historical data

This figure shows scans of three historical newspapers containing bank stock price data. Panel A shows Italian bank stock prices at the end of 1904 from the newspaper *La Stampa*. Panel B shows Dutch bank stock prices at the end of 1908 from the newspaper *De Telegraaf*. Panel C shows German bank stock prices at the end of 1873 from the newspaper *Berliner Boersen-Zeitung*. The full list of historical primary sources for bank stock prices and dividends can be found in the Data Appendix.

(A) Italian bank stock prices, 1904

BORSE ITALIANE.

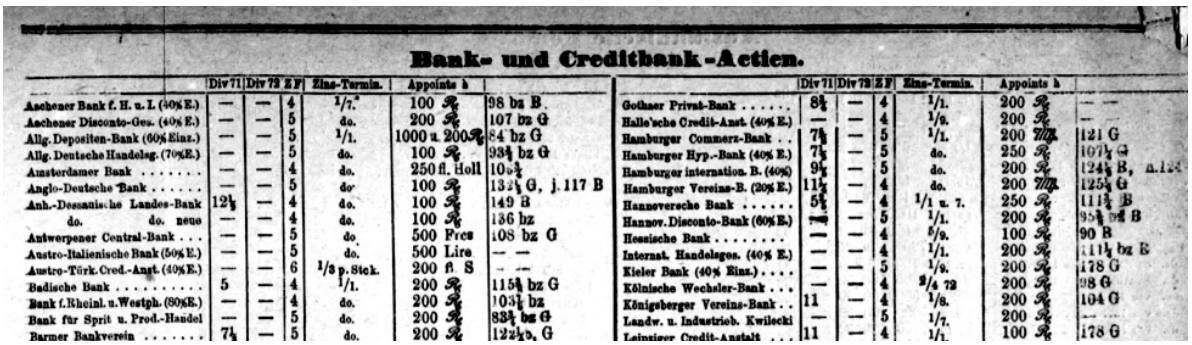
Corsi di chiusura del 28 dicembre 1904.

Valori	Roma	Milano	Genova	Firenze
Rend. it. 5 0/0 perc.	105 35	105 25	105 32 1/2	105 37
» f.m.	105 50	105 30	105 37 1/2	105 32 1/2
3 1/2 0/0 p.c.	103 45 1/2	—	—	103 25
» f.m.	103 35	103 37 1/2	103 37 1/2	103 30
Az. Banca d'It.	1132 —	1134 50	1135 50	— —
» Banca Comm.	629 —	628 50	629 —	— —
» Credito Ital.	611 —	611 —	612 —	— —
» Meridionali	736 —	736 —	736 —	736 —
» Mediterranee	— —	459 —	460 —	460 50
» Rubattino	— —	468 50	470 —	— —
» Terni	— —	1945 —	1949 —	— —
» Elba	— —	— —	— —	— —
» Savona	— —	— —	— —	— —
» Molini Alta It.	— —	— —	— —	— —
» Fridania	— —	— —	— —	— —
» Carburo Rom.	— —	— —	— —	— —

(B) Dutch bank stock prices, 1908

	V.K.	L.K.	H.K.
Amst. Liq.-Kas. dito...	115	——	——
Buit. Bankver. A-U. dito	64	——	——
Cent. Bankv. L. & N. dito	——	——	——
Cen. Cred.-Bank S.....4½	99¾	——	——
Cent. Werkg. Ris.-B. O.4½	100¾	100¾	——
Crediet-Vereen. A.....	101½	——	——
Disc. en Eff.b. 1&2ser.do.	112	——	——
Disc.-Mij te Rotterd. do.	——	——	——
Fin. Mij v. Zuid-Afr. do.	95	——	——
Geld. Crediet-vereenig.	165	——	——
Gemeente-Cred. Obl. 4	101½	——	——
dito dito dito 3½	96½	96⅛	——
dito dito dito 3	85¼	85⅝	——
dito dito dito 2½	——	——	——
Holl. Belegg. Cie. dito 4	98	——	——
Holl. Voorsch. Bk. S. b..	100	——	——
Incasso Bank Aand...	116½	——	——
Ind. Bnk. te Haarl. di..	——	——	——
Kas Vereeniging Aand.	142	142½	——

(C) German bank stock prices, 1873



Bank- und Creditbank-Actien.

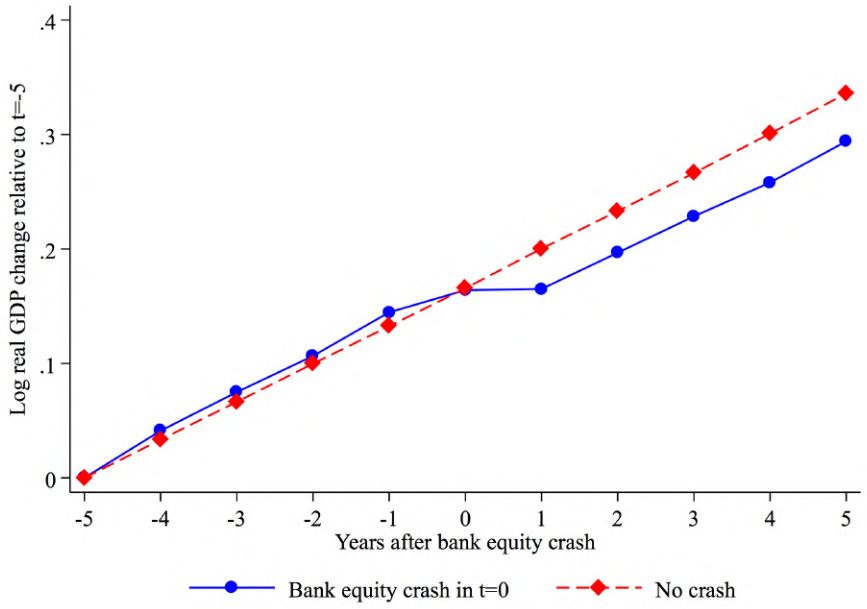
	Div 71	Div 72	E F	Einz-Termin.	Appoints b	
Aachener Bank f. H. u. L. (40% E.)	—	—	4	1/7.	100 ℛ	98 bz B
Aachener Disconto-Ges. (40% E.)	—	—	5	do.	200 ℛ	107 bz G
Allg. Depositen-Bank (60% Einz.)	—	—	5	1/1.	1000 u. 200 ℛ	84 bz G
Allg. Deutsche Handelsg. (70% E.)	—	—	5	do.	100 ℛ	93¾ bz G
Amsterdamer Bank	—	—	4	do.	250 fl. Holl	10⅝
Anglo-Deutsche Bank	—	—	5	do	100 ℛ	132½ G, j. 117 B
Anh.-Dessauische Landes-Bank	12½	—	4	do.	100 ℛ	149 B
do. do. neue	—	—	4	do.	100 ℛ	136 bz
Antwerpener Central-Bank	—	—	5	do.	500 Frcs	108 bz G
Austro-Italienische Bank (50% E.)	—	—	5	do.	500 Lire	— —
Austro-Türk. Cred.-Angt. (40% E.)	—	—	6	1/8 p. Stck.	200 fl S	— —
Badische Bank	5	—	4	1/1.	200 ℛ	115⅝ bz G
Bank f. Rheinl. u. Westph. (80% E.)	—	—	4	do.	200 ℛ	103½ bz
Bank für Sprit u. Prod.-Handel	—	—	5	do.	200 ℛ	83⅜ bz G
Barmer Bankverein	7½	—	5	do.	200 ℛ	122½b. G

	Div 71	Div 72	E F	Einz-Termin.	Appoints b	
Gothaer Privat-Bank	8½	—	4	1/1.	200 ℛ	— —
Halle'sche Credit-Anst. (40% E.)	—	—	4	1/9.	200 ℛ	—
Hamburger Commerz-Bank ..	7⅛	—	5	1/1.	200 ℛ	121 G
Hamburger Hyp.-Bank (40% E.)	7⅛	—	5	do.	250 ℛ	107½ G
Hamburger internation. B. (40%)	9⅛	—	5	do.	200 ℛ	124⅛ B, a. 124
Hamburger Vereins-B. (20% E.)	11½	—	4	do.	200 ℛ	125⅛ G
Hannoversche Bank	5⅛	—	4	1/1 u. 7.	250 ℛ	111⅛ B
Hannov. Disconto-Bank (60% E.)	—	—	5	1/1.	200 ℛ	95⅛ bz B
Hessische Bank	—	—	4	5/9.	100 ℛ	90 B
Internat. Handelsges. (40% E.)	—	—	4	1/1.	200 ℛ	111½ bz B
Kieler Bank (40% Einz.)	—	—	5	1/9.	200 ℛ	178 G
Kölnische Wechsler-Bank ...	—	—	4	2/4 72	200 ℛ	98 G
Königsberger Vereins-Bank ..	11	—	4	1/8.	200 ℛ	104 G
Landw. u. Industrieb. Kwilecki	—	—	5	1/7.	200 ℛ	— —
Leipziger Credit-Anstalt ...	11	—	4	1/1.	100 ℛ	178 G

Figure 2: Dynamics of output and credit around bank equity crashes

This figure presents the average dynamics of real GDP and credit-to-GDP around 30% bank equity crashes. Bank equity crashes are defined to occur in year $t = 0$. Each panel plots cumulative growth in a given variable from five years before a bank equity crash ($t = -5$) to five years after the crash ($t = 5$). For comparison, average dynamics around years with no crash are presented in red.

(A) Real GDP



(B) Credit-to-GDP

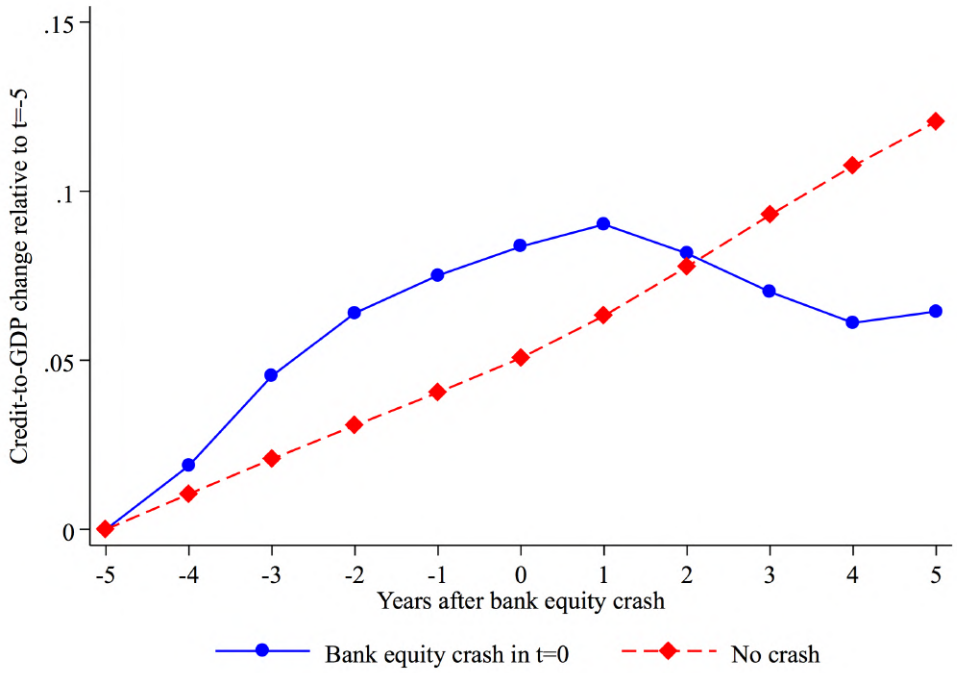
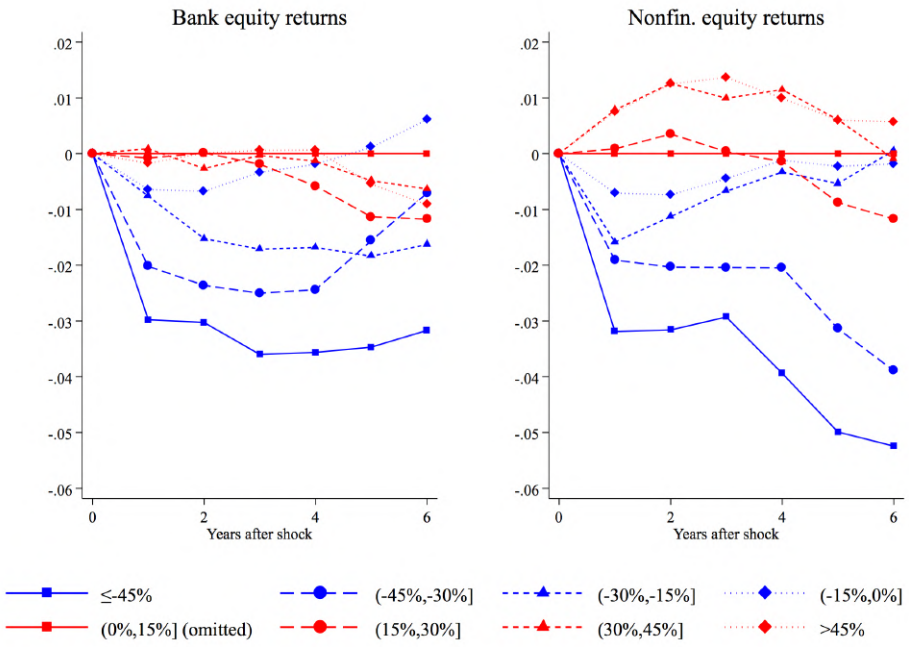


Figure 3: Bank equity crashes predict output gaps and credit contraction

This figure plots the impact of bank equity and nonfinancial equity returns on real GDP (Panel A) and bank credit-to-GDP (Panel B). The responses are estimated jointly using Equation 1, which includes eight bins of bank and nonfinancial equity returns to capture the predictive content across the return distribution. The specification controls for country fixed effects and contemporaneous and lagged real GDP growth and the change in credit-to-GDP. The responses to bank equity and nonfinancial equity returns are estimated jointly. The x-axis is time in years, and the y-axis is real GDP or bank credit-to-GDP relative to the omitted return bin (return between 0% and 15%).

(A) Real GDP response



(B) Credit-to-GDP response

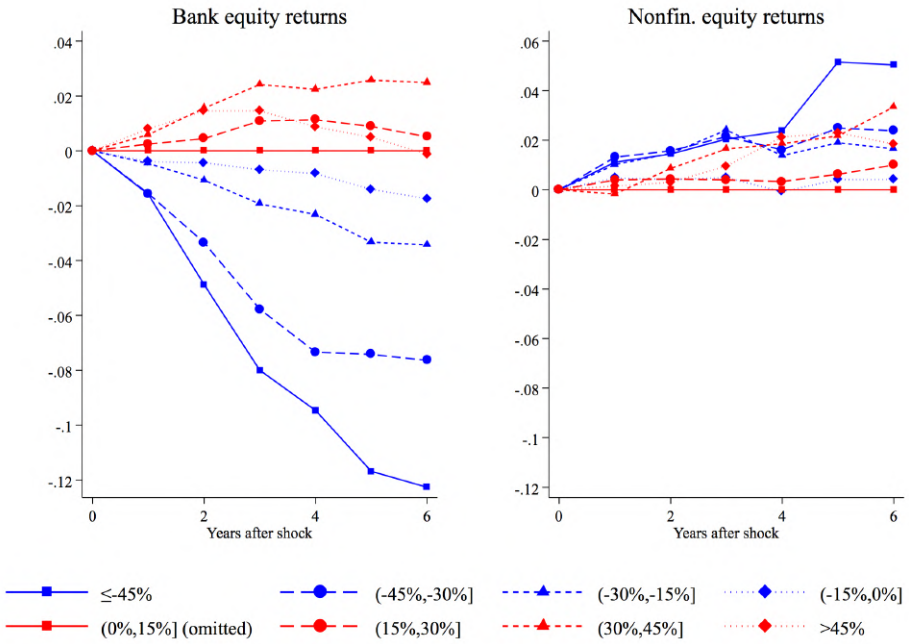
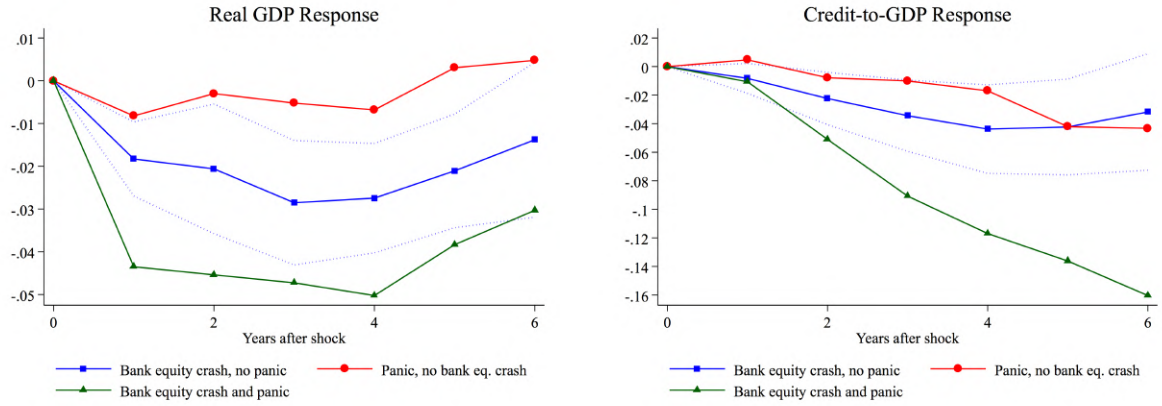


Figure 4: Impact of non-panic banking distress

This figure presents the response of real GDP and credit-to-GDP to 30% bank equity crashes, distinguishing between 30% bank equity crashes that coincide with a bank panic and crashes that are not associated with a panic. The impulse responses are estimated from Equation 3. Panel A presents the results from the baseline specification. Panel B defines episodes of banking sector distress as years with a 30% bank equity crash *and* narrative evidence of widespread bank failures. The responses are estimated using local projections, controlling for contemporaneous and lagged nonfinancial equity crash indicators, real GDP growth, and the change in credit-to-GDP. All specifications also control for country fixed effects. The dashed lines represent 95% confidence intervals based on standard errors double-clustered on country and year.

(A) Baseline



(B) Conditioning on bank failures

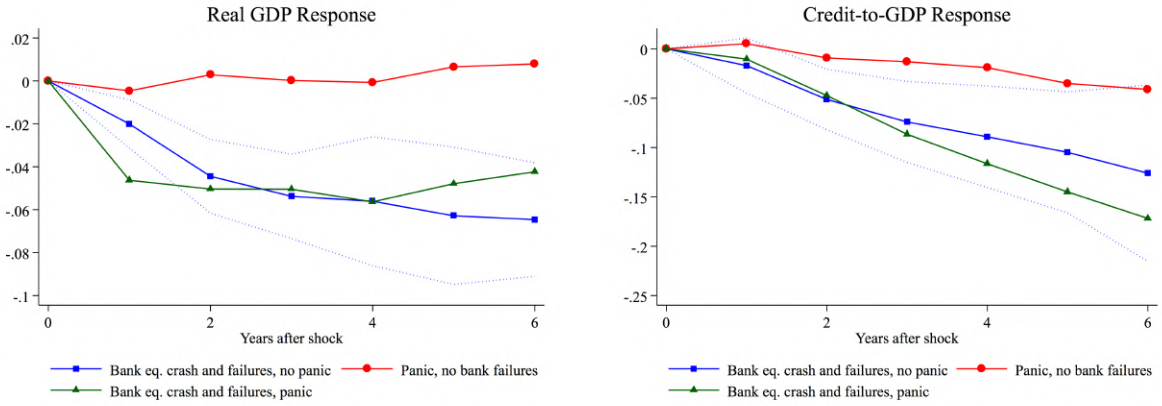
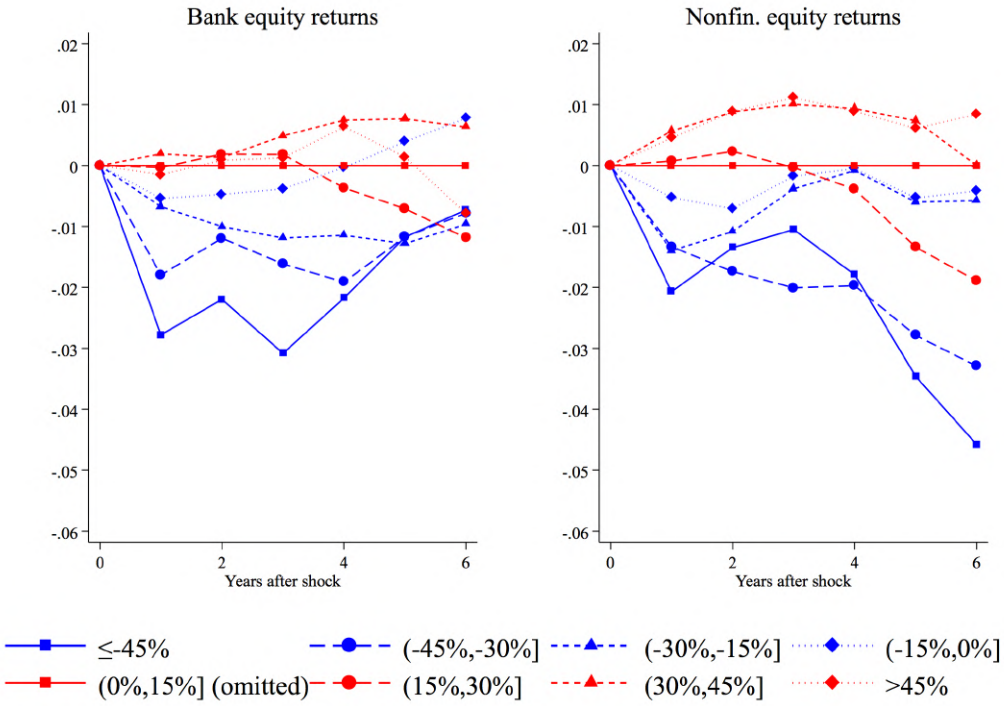


Figure 5: Impact of bank equity crashes outside Narrative Crises

This figure shows that bank equity crashes predict output gaps and credit contraction even excluding narrative-based banking crisis episodes. Local projection impulse responses are estimated as in Figure 3 but exclude observations within a ±3-year window around Narrative Crises.

(A) Real GDP response



(B) Credit-to-GDP response

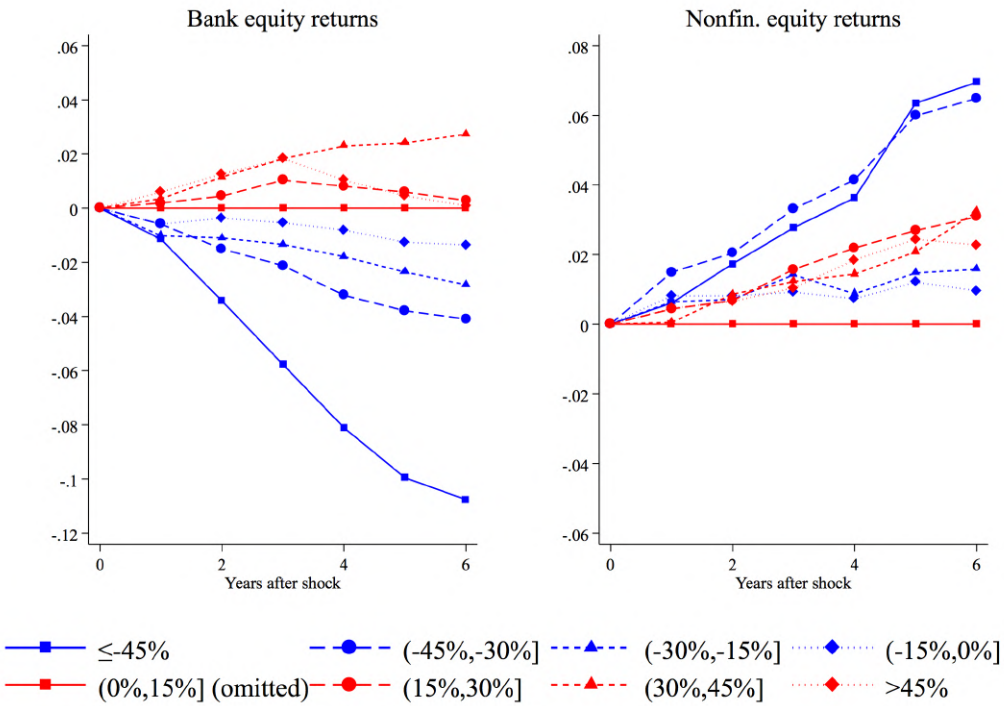


Figure 6: Equity returns and credit spreads around the U.S. 2007-8 banking crisis

This figure plots bank and nonfinancial equity total return indexes and credit spreads around the U.S. 2007-8 banking crisis. The bank equity index is in blue, the nonfinancial equity index is in red, corporate credit spreads are in black (dashed is the AAA 10-year Corporate minus 10-year Treasury spread, solid is the BAA minus AAA 10-year Corporate spread), and the 3-month LIBOR minus OIS spread is in green. The scale on the left corresponds to equity returns, and the scale on the right corresponds to bond yield spreads.

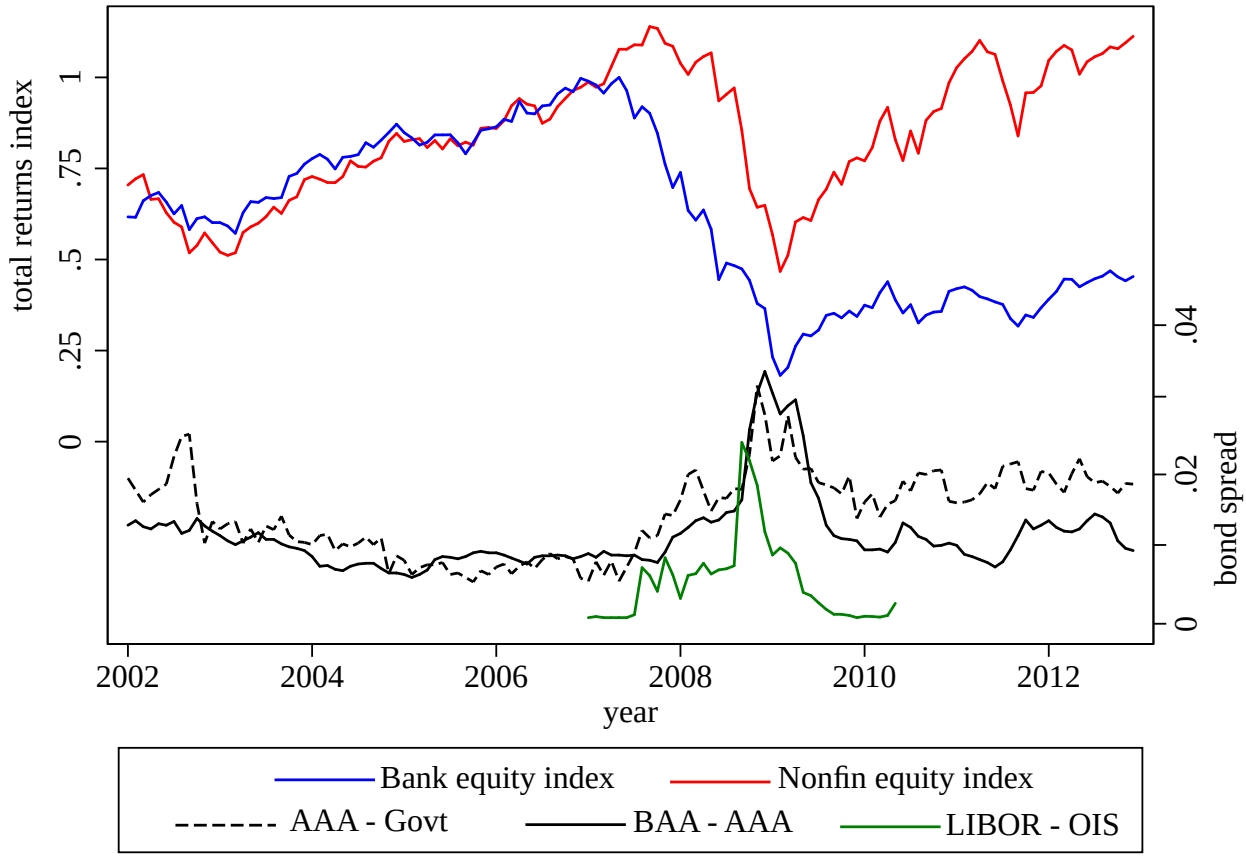
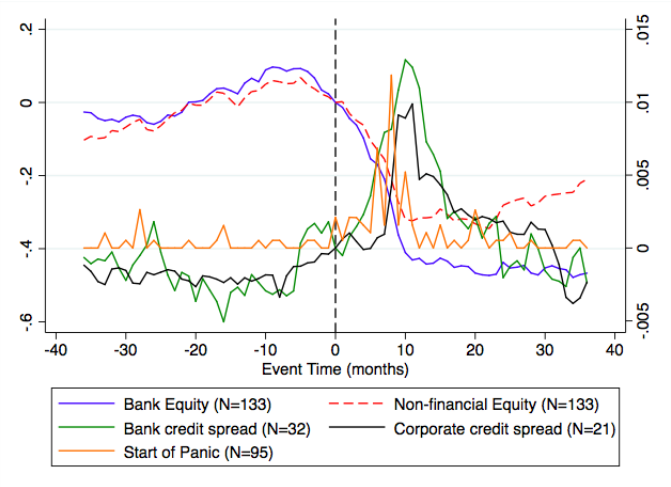


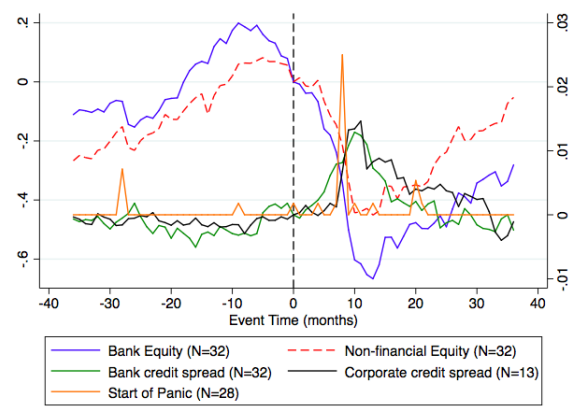
Figure 7: Timing of bank equity declines relative to panic dates and other crisis indicators

This figure compares the average evolution, around BVX Crises, of monthly bank equity returns relative to a series of other crisis indicators. The other crisis indicators are nonfinancial equity returns, bank credit spreads, corporate credit spreads, and the first month of a banking panic based on narrative accounts. Equity indexes and credit spreads are normalized to 0 in event month 0, defined as January of the BVX crisis year. The curve representing the Start of Panic is a frequency plot of the first month of the banking panic based on narrative accounts. The Start of Panic curve does not correspond to either axis, but the area under this curve is one. Panel A presents results for the full sample, Panel B uses a sample where bank equity, nonfinancial equity, and bank credit spreads are all non-missing, and Panels C-E present results across subsamples.

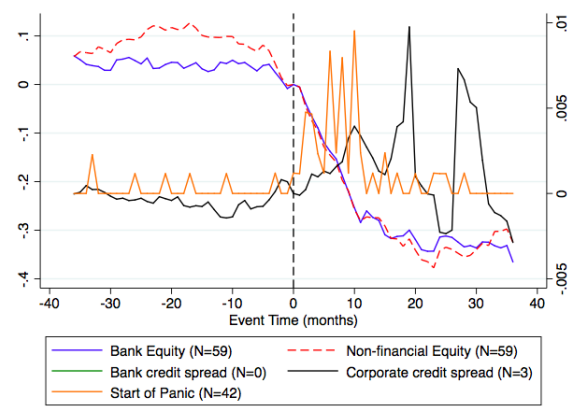
(A) Full sample



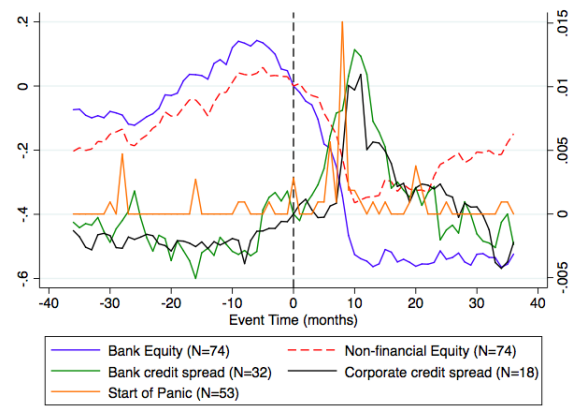
(B) Consistent sample



(C) 1870-1939



(D) 1940-2016



(E) 1940-2006

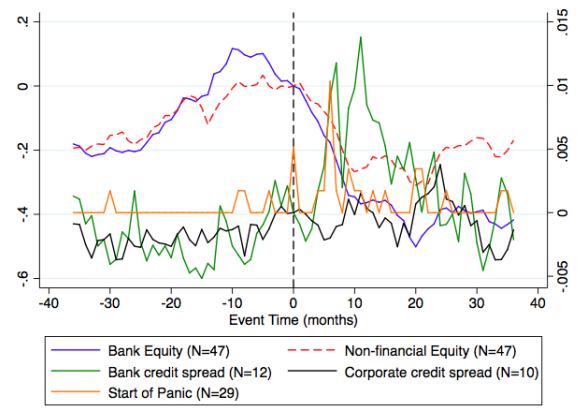
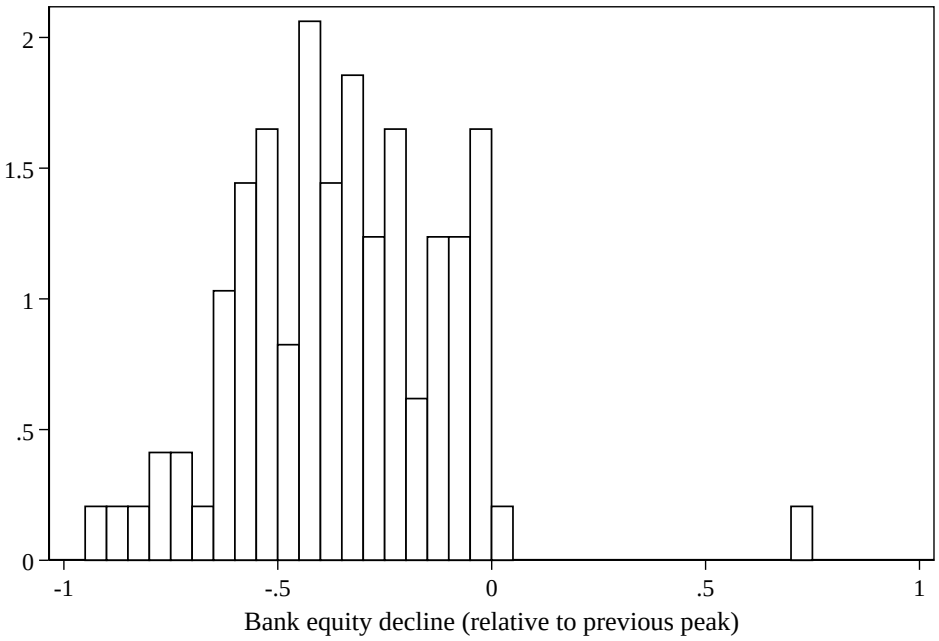


Figure 8: Bank equity falls substantially before the start of banking panics

Panel A shows the distribution of bank equity returns from its previous peak to the month before a panic. The unit of observation is an episode in which a panic occurred and the month of the panic is known. Panel B is the bank equity decline from Panel A normalized by its eventual total peak-to-trough decline. The figure illustrates that bank equity falls substantially (on average by 36%) before the panic occurs.

(A) Bank equity decline up to month before panic



(B) As a percentage of total eventual peak-to-trough decline

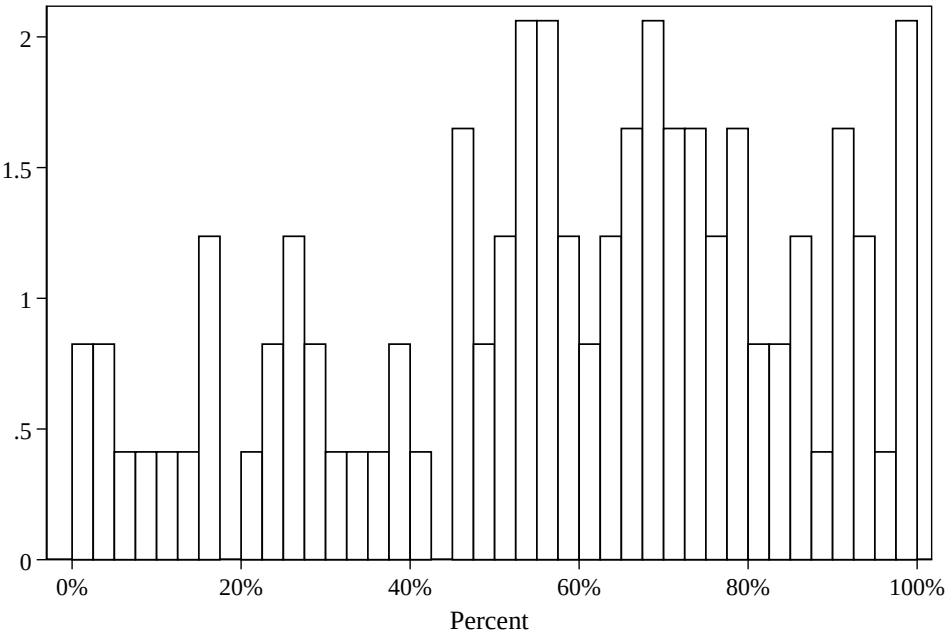


Table 1: Narrative-based banking crises in Germany

This table illustrates disagreement among narrative-based chronologies regarding the occurrence of historical banking crises, focusing on the case of Germany (similar results hold for other countries, see Appendix Table A1). It lists the occurrence of banking crises according to six prominent papers. Years listed correspond to the starting year of the banking crisis, according to each paper. A "0" means that the source reports no banking crisis in a given year, while a blank cell means that the crisis is not covered in the sample period.

Reinhart Rogoff	Schularick Taylor	Laeven Valencia	Bordo	Caprio Klingebiel	Demirguc-Kunt & Detragiache
0	1873				
1880	0				
1891	1891		0		
1901	1901		1901		
0	1907		0		
1925	0		0		
1929	1931		1931		
1977	0	0	0	late 1970s	
2008	2008	2008		0	

Table 2: Bank equity crashes predict output gaps and credit contraction

This table shows that bank equity crashes predict lower subsequent real GDP and credit-to-GDP. The results are estimated from Equation 2. A bank (nonfinancial) equity crash is defined as 30% decline in the bank (nonfinancial) equity total return index from year $t-1$ to year t. Controls are contemporaneous real GDP growth and credit-to-GDP change, as well as three lags in the bank equity crash indicator, nonfinancial equity crash indicator, credit-to-GDP change, and real GDP growth. t-statistics in brackets are computed from standard errors double-clustered on country and year. *,**,*** indicate significance at the 0.1, 0.05, and 0.01 levels, respectively.

Panel A: Real GDP growth

	Real GDP growth$_{t,t+1}$			Real GDP growth$_{t,t+3}$		
	(1)	(2)	(3)	(4)	(5)	(6)
Bank equity crash	-0.033***	-0.026***	-0.019***	-0.045***	-0.034***	-0.029***
	[-6.73]	[-6.38]	[-4.98]	[-5.92]	[-5.50]	[-5.84]
Nonfinancial equity crash	-0.023***	-0.022***	-0.010**	-0.031***	-0.029***	-0.023**
	[-3.80]	[-4.33]	[-2.32]	[-2.79]	[-3.07]	[-2.44]
Country fixed effects	✓	✓	✓	✓	✓	✓
Controls		✓	✓		✓	✓
Year fixed effects			✓			✓
Adj. R^2 (within)	0.11	0.19	0.085	0.049	0.11	0.069
N	2548	2548	2548	2548	2548	2548

Panel B: Credit-to-GDP change

	Credit-to-GDP change$_{t,t+1}$			Credit-to-GDP change$_{t,t+3}$		
	(1)	(2)	(3)	(4)	(5)	(6)
Bank equity crash	-0.020***	-0.010*	-0.011*	-0.077***	-0.057***	-0.051***
	[-2.71]	[-1.72]	[-1.87]	[-4.75]	[-4.27]	[-3.72]
Nonfinancial equity crash	0.010**	0.0071	0.0031	0.0077	0.0035	-0.0038
	[2.26]	[1.56]	[0.69]	[0.73]	[0.25]	[-0.29]
Country fixed effects	✓	✓	✓	✓	✓	✓
Controls		✓	✓		✓	✓
Year fixed effects			✓			✓
Adj. R^2 (within)	0.0065	0.22	0.21	0.027	0.14	0.13
N	2535	2535	2535	2535	2535	2535

Table 3: Impact of non-panic banking distress

This table presents the response of real GDP and credit-to-GDP to 30% bank equity crashes, distinguishing between 30% bank equity crashes that coincide with a bank panic and crashes that are not associated with a panic. The coefficients are estimated from Equation 3. Panel A presents the results from the baseline specification. Panel B defines episodes of banking sector distress as years with a 30% bank equity crash *and* narrative evidence of widespread bank failures ("Bank eq. crash and failures"). Controls include three lags of all right-hand-side variables reported in the table, as well as contemporaneous and lagged real GDP growth and credit-to-GDP change. t-statistics in brackets are computed from standard errors double-clustered on country and year. *,**,*** indicate significance at the 0.1, 0.05, and 0.01 levels, respectively.

Panel A: Baseline

	Real GDP growth$_{t,t+3}$			Credit-GDP change$_{t,t+3}$		
	(1)	(2)	(3)	(4)	(5)	(6)
Bank equity crash	-0.0301***	-0.0285***	-0.0240***	-0.0506***	-0.0344**	-0.0321***
	[-3.07]	[-3.84]	[-3.28]	[-3.33]	[-2.70]	[-2.75]
Panic	-0.0195	-0.00522	0.00594	0.00387	-0.0100	-0.0111
	[-1.45]	[-0.38]	[0.47]	[0.28]	[-0.60]	[-0.61]
Bank equity crash × Panic	-0.0270	-0.0135	-0.0206	-0.0734***	-0.0463*	-0.0405
	[-1.68]	[-0.95]	[-1.58]	[-2.84]	[-2.02]	[-1.58]
Nonfinancial equity crash	-0.0298**	-0.0286***	-0.0238**	0.00880	0.00360	-0.00425
	[-2.63]	[-2.81]	[-2.37]	[0.78]	[0.26]	[-0.30]
Country fixed effects	✓	✓	✓	✓	✓	✓
Controls		✓	✓		✓	✓
Year fixed effects			✓			✓
Adj. R^2 (within)	0.0552	0.112	0.0710	0.0328	0.152	0.134
N	2548	2548	2548	2536	2536	2536

Panel B: Conditioning on bank failures

	Real GDP growth$_{t,t+3}$			Credit-GDP change$_{t,t+3}$		
	(1)	(2)	(3)	(4)	(5)	(6)
Bank eq. crash and failures	-0.0644***	-0.0538***	-0.0427***	-0.0993***	-0.0741***	-0.0739***
	[-5.73]	[-5.36]	[-5.57]	[-4.93]	[-3.54]	[-3.84]
Panic	-0.0161	0.000222	0.00714	-0.000615	-0.0131	-0.0124
	[-1.28]	[0.016]	[0.55]	[-0.042]	[-0.75]	[-0.65]
Bank eq. crash and failures × Panic	0.00138	0.00309	-0.00131	-0.0109	0.000607	0.00312
	[0.079]	[0.20]	[-0.088]	[-0.32]	[0.022]	[0.10]
Nonfinancial equity crash	-0.0355***	-0.0338***	-0.0273**	-0.00995	-0.00472	-0.00826
	[-3.23]	[-3.30]	[-2.58]	[-0.84]	[-0.42]	[-0.65]
Country fixed effects	✓	✓	✓	✓	✓	✓
Controls		✓	✓		✓	✓
Year fixed effects			✓			✓
Adj. R^2 (within)	0.0571	0.113	0.0713	0.0268	0.156	0.140
N	2548	2548	2548	2536	2536	2536

Table 4: Timing of bank equity crashes relative to panics, nonfinancial equity crashes, and credit spread spikes

This table analyzes monthly data around BVX Crisis List episodes to compare the relative timing of various banking crisis indicators. Panel A compares the timing of 30% bank equity crashes with panic start dates, credit spread spikes, and narrative crisis start dates. The time difference is positive if the bank equity crash is recorded before the other event and negative if after the event. Panel B column 1 records the average time difference in months between detecting a 30% bank equity crash relative to a 30% nonfinancial equity crash. Column 2 records the average time difference in months between a bank equity peak and a nonfinancial equity peak. Column 3 records the average duration of a bank equity crash from peak to trough. Panel C performs the same analysis as Panel B column 1 for separate subsamples. For each column in all panels, a t-statistic is calculated under the null hypothesis that the average time difference is zero. As an alternative non-parametric test, we also count in how many of the episodes the bank equity decline is recorded first ("pos"), the other event is recorded first ("neg"), or both events are recorded in the same month ("zero"). We then calculate the fraction of times that the bank equity decline happens first ("pos / (pos + neg)") and calculate a p-value under the null hypothesis that the bank equity decline happening first is Bernoulli-distributed with parameter 0.50. *,**,*** indicate significance at the 0.1, 0.05, and 0.01 levels, respectively.

Panel A: Bank equity crashes detect the crisis before the panic month, credit spread spikes, and narrative crisis dates

	Before panic	Before Reinhart-Rogoff start dates	Before earliest narrative start dates	Before 2% spike in bank credit spread	Before 1% spike in bank credit spread	Before 2% spike in corp credit spread	Before 1% spike in corp credit spread
Average (in months, signed)	8.57***	2.88**	2.54**	6.23***	3.43*	9.25***	4.5**
t-stat	5.67	2.31	2.16	5.89	1.95	7.07	1.99
N	89	97	106	39	40	20	20
Pos	67	38	32	31	22	17	13
Zero	6	36	56	4	2	1	0
Neg	16	23	18	4	16	2	7
Pos / (Pos + Neg)	80.7%***	62.3%**	64.0%**	88.6%***	57.9%	89.5%***	65.0%
p-value	0.000	0.036	0.032	0.000	0.209	0.000	0.132

Panel B: Bank equity crashes pick up the crisis first before nonfinancial equity crashes

	Before nonfin. eq. crash	Bank equity peak before nonfin eq peak	Duration of bank equity decline
Average (in months, signed)	1.77**	1.15*	27.52***
t-stat	2.13	1.75	24.60
N	129	140	141
Pos	66	57	Duration $\geq$ 24 mo. = 86 episodes
Zero	16	39	
Neg	47	44	Duration $<$ 24 mo. = 55 episodes
Pos / (Pos + Neg)	58.4%**	56.4%	% Duration $\geq$ 24 mo. = 61%***
p-value	0.045	0.116	0.006

Panel C: Bank vs nonfinancial equity crashes: subsample analysis

	Prewar	Postwar	Postwar & Emerging	Postwar & Advanced	Postwar (pre-2006) & Advanced
Average (in months, signed)	-0.32	3.09***	0.15	6.10***	4.38**
t-stat	-0.23	3.09	0.10	5.04	2.06
N	50	79	40	39	16
Pos	21	45	18	27	10
Zero	4	12	5	7	2
Neg	25	22	17	5	4
Pos / (Pos + Neg)	45.7%	67.2%	51.4%	84.4%	71.4%
p-value	0.769	0.003	0.500	0.000	0.090

Table 5: Distribution of credit spread increases just after bank equity crashes

This table presents the distribution of credit spread increases just after bank equity crashes around BVX Crisis List episodes. Each row presents the distribution in credit increases in the month following a given decrease in bank stocks (relative to the previous bank stock peak). For example, row 3 shows the distribution of credit spread increases when the bank equity index first falls by more than -30%. Panel A presents the analysis for bank credit spreads, and Panel B presents the analysis for corporate credit spreads.

Panel A: The distribution of bank credit spread increases subsequent to bank equity crashes

	... bank credit spreads increase by (in percentage points):								
	10^{th} pctile	20^{th} pctile	30^{th} pctile	40^{th} pctile	50^{th} pctile	60^{th} pctile	70^{th} pctile	80^{th} pctile	90^{th} pctile
When banks stocks fall more than...									
-20%	0	0	0	0.30	0.52	0.70	0.99	1.20	3.46
-25%	0	0	0	0.33	0.52	0.73	0.99	1.20	3.46
-30%	0	0	0.21	0.43	0.55	0.81	1.02	2.34	15.11
-35%	0	0.01	0.34	0.52	0.63	0.91	1.30	2.95	18.19
-40%	0	0.26	0.50	0.61	0.79	1.18	2.16	4.15	64.71
-45%	0	0.34	0.54	0.66	0.85	1.31	2.31	4.15	64.71
-50%	0.09	0.48	0.60	0.85	1.16	1.76	2.99	6.95	80.75
-55%	0.29	0.57	0.83	1.10	1.30	2.41	3.44	6.50	39.08
-60%	0.38	0.63	1.08	1.26	1.84	2.79	5.81	7.23	42.28

Panel B: The distribution of corporate credit spread increases subsequent to bank equity crashes

	... corporate credit spreads increase by (in percentage points):								
	10^{th} pctile	20^{th} pctile	30^{th} pctile	40^{th} pctile	50^{th} pctile	60^{th} pctile	70^{th} pctile	80^{th} pctile	90^{th} pctile
When banks stocks fall more than...									
-20%	0	0	0	0	0	0.29	0.80	1.06	1.80
-25%	0	0	0	0	0	0.29	0.80	1.06	1.80
-30%	0	0	0	0	0.25	0.45	1.06	1.52	1.80
-35%	0	0	0	0.11	0.27	0.59	1.16	1.54	2.03
-40%	0	0	0	0.19	0.36	0.73	1.25	1.57	2.40
-45%	0	0	0.03	0.31	0.41	0.86	1.35	1.59	2.70
-50%	0	0	0.23	0.34	0.45	0.96	1.41	1.61	2.94
-55%	0	0	0.15	0.32	0.41	1.06	1.45	2.67	4.70
-60%	0.09	0.39	1.00	1.14	1.30	1.49	1.88	3.31	4.87

Table 6: The BVX Crisis List

This table lists a chronology of episodes defined by large aggregate bank losses and widespread bank failures, which we refer to as the BVX Crisis List. The BVX Crisis List covers 46 countries from 1870 to 2016. As described in the text, this list excludes Narrative Crises that do not featuring large aggregate bank losses (as measured by large bank equity declines) or narrative evidence of widespread bank failures; see Appendix Table A9. Newly-identified banking crises (that did not previously appear on the Narrative Crises list) are marked with a "*". The bank equity return is the arithmetic peak-to-trough real total return for each episode. "0" indicates no decline in bank equity. A blank entry indicates a lack of bank equity return data for that episode.

Country	Starting year of crisis	Bank equity return	Country	Starting year of crisis	Bank equity return	Country	Starting year of crisis	Bank equity return
Argentina	1891	-0.307	Chile (cont.)	1931*	-0.356	Greece	1929	-0.727
	1914	-0.473		1976	0		1992	-0.391
	1930	-0.819		1982	-0.837		2008	-0.671
	1934	-0.563	Colombia	1931*	-0.675		2010*	-0.961
	1980			1982	-0.831	Hong Kong	1892*	-0.565
	1985			1998	-0.813		1982	-0.445
	1989		Czech	1991			1998	-0.464
	1995	-0.305		1995	-0.904	Hungary	1873*	-0.518
	2000	-0.656	Denmark	1877	-0.207		1931	
Australia	1893	-0.469		1885	-0.043		1991	
	1989	-0.281		1907	-0.269		1995*	-0.398
Austria	1873	-0.715		1919	-0.347		2008	-0.671
	1924	-0.24		1992	-0.425	Iceland	1920*	-0.535
	1931	-0.566		2008	-0.739		1930*	-0.359
	2008	-0.673		2011*	-0.444		1985	
	2011*	-0.509	Egypt	1907	-0.132		1993	
Belgium	1876*	-0.565		1914	-0.407		2008	-0.963
	1883	-0.307		1931	-0.608	India	1913	-0.249
	1914			1980			1920	-0.495
	1929	-0.831		1990			1993	-0.561
	1939	-0.511	Finland	1877		Indonesia	1990	-0.659
	2008	-0.842		1900			1998	-0.88
	2011*	-0.755		1921	-0.569	Ireland	2007	-0.918
Brazil	1890	-0.275		1931	-0.252		2010*	-0.908
	1900	0		1990	-0.814	Israel	1983	-0.499
	1914	-0.374	France	1882	-0.456	Italy	1873	-0.237
	1923	-0.131		1889	-0.106		1889	-0.348
	1985			1914	-0.475		1891	-0.453
	1990			1930	-0.571		1907	-0.24
	1994			1994	-0.246		1914	-0.333
Canada	1873	0		2008	-0.64		1921	-0.55
	1907	-0.081	Germany	1874	-0.371		1930	-0.073
	1920	-0.426		1891	-0.23		1992	-0.397
	1983	-0.164		1901	-0.05		2008	-0.575
Chile	1898	-0.003		1925	-0.42		2011*	-0.601
	1907			1930	-0.489	Japan	1882	
	1914			2008	-0.728		1890	
	1925							

Table 6: The BVX Crisis List (cont.)

Country	Starting year of crisis	Bank equity return	Country	Starting year of crisis	Bank equity return	Country	Starting year of crisis	Bank equity return
Japan (cont.)	1901	-0.221	Peru (cont.)	1931*	-0.373	Switzerland	1870	-0.418
	1907	-0.377		1981	-0.98		1919	-0.432
	1920	-0.405		1998	-0.396		1931	-0.559
	1922*	-0.405	Philippines	1981	-0.719		1990	-0.326
	1923	-0.157		1997	-0.687		2008	-0.676
	1927	-0.168	Portugal	1890		Taiwan	1923	
	1990	-0.546		1921	-0.643		1927	
	1997	-0.605		1923	-0.684		1983	
	2001*	-0.808		1931	-0.597		1995	-0.307
Korea	1984	-0.326		2008	-0.613		1998	-0.557
	1997	-0.726		2011*	-0.725	Thailand	1979	-0.461
Luxembourg	2008	-0.474	Russia	1875	-0.188		1983	0
Malaysia	1985	-0.368		1900	-0.401		1997	-0.734
	1997	-0.686		1995		Turkey	1914*	-0.654
Mexico	1883			1998	-0.751		1930	-0.719
	1893	-0.325		2008	-0.723		1980	-0.409
	1908	-0.029	Singapore	(no crises)			1991	-0.758
	1913	-0.596	South Africa	1881	-0.27		1994	-0.203
	1921			1890	-0.062		2001	-0.622
	1928	-0.839		1984	-0.492	U.K.	1878	-0.132
	1981		Spain	1882	-0.349		1890	-0.128
	1994	-0.602		1890	-0.124		1914	
Netherlands	1907	-0.083		1920	-0.14		1973	-0.737
	1914	-0.093		1924	-0.222		1991	-0.147
	1921	-0.251		1931	-0.336		2008	-0.707
	1931*	-0.418		1975	-0.814	U.S.	1873	-0.172
	2008	-0.562		2008	-0.466		1884	0
New Zealand	1888	-0.549		2010*	-0.411		1890	0
	1894	-0.337	Sweden	1878			1893	-0.29
	1987	-0.892		1907	-0.135		1907	-0.334
Norway	1898			1919	-0.395		1930	-0.654
	1914			1932	-0.431		1984	-0.263
	1919	-0.71		1991	-0.787		1990	-0.332
	1931	0		2008	-0.519		2007	-0.676
	1987	-0.464				Venezuela	1981	-0.34
Peru	1876						1992	-0.839
	1914*	-0.612					2008	-0.614

Table 7: BVX Crisis List summary statistics

This table compares average outcomes of added episodes (newly-uncovered banking crises), deleted episodes (spurious banking crises), BVX Crisis List episodes, and BVX Crisis List episodes having a bank equity decline of more than -30%.

	Added		Deleted		BVX Crisis List		BVX Crisis List (Bank equity decline < -30%)	
Bank equity decline	-0.563	(N=23)	-0.081	(N=43)	-0.461	(N=185)	-0.598	(N=115)
Abnormal bank equity decline	-0.403	(N=16)	-0.160	(N=41)	-0.353	(N=170)	-0.423	(N=101)
Bank market cap decline	-0.563	(N=11)	-0.088	(N=20)	-0.409	(N=81)	-0.516	(N=54)
Real GDP decline (pk to tr)	-0.094	(N=22)	-0.025	(N=49)	-0.053	(N=209)	-0.062	(N=112)
Real GDP growth decline (pk to tr)	-0.090	(N=20)	-0.055	(N=49)	-0.085	(N=207)	-0.091	(N=110)
Real GDP growth (max dev from trend)	-0.077	(N=22)	-0.038	(N=49)	-0.059	(N=209)	-0.066	(N=113)
Failed banks (% of total bank assets)	0.322	(N=1)	0.035	(N=9)	0.293	(N=63)	0.309	(N=43)
NPL at peak	0.113	(N=2)	0.046	(N=7)	0.165	(N=65)	0.151	(N=44)
Decline in deposits (pre-war only)	-0.115	(N=2)	-0.066	(N=16)	-0.184	(N=48)	-0.190	(N=25)
Significant liability guarantees	0.000	(N=0)	0.273	(N=22)	0.541	(N=122)	0.642	(N=67)
Significant liquidity support	0.500	(N=2)	0.348	(N=23)	0.729	(N=133)	0.800	(N=75)