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Michael D. Bordo

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An Historical Perspective on the Quest for Financial Stability and the Monetary Policy Regime
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ABSTRACT

This paper surveys the co-evolution of monetary policy and financial stability for a number of countries across four exchange rate regimes from 1880 to the present. I present historical evidence on the incidence, costs and determinants of financial crises, combined with narratives on some famous financial crises. I then focus on some empirical historical evidence on the relationship between credit booms, asset price booms and serious financial crises. My exploration suggests that financial crises have many causes, including credit driven asset price booms, which have become more prevalent in recent decades, but that in general financial crises are very heterogeneous and hard to categorize. Two key historical examples stand out in the record of serious financial crises which were linked to credit driven asset price booms and busts: the 1920s and 30s and the Global Financial Crisis of 2007-2008. The question that arises is whether these two ‘perfect storms’ should be grounds for permanent changes in the monetary and financial environment.

Michael D. Bordo
Department of Economics
Rutgers University
New Jersey Hall
75 Hamilton Street
New Brunswick, NJ 08901
and NBER
bordo@econ.rutgers.edu

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1. Introduction

Economic development and growth in the past two centuries have been facilitated by stabilizing monetary and financial regimes. Good macroeconomic institutions encourages growth and financial development directly through financial innovation (King and Levine (1993), Rousseau and Sylla (2006)) and indirectly by allowing private agents to make economic decisions in a stable environment.

Macroeconomic stability comprises price level stability (today low inflation) ; limited volatility in the real economy (smoothing the business cycle) and financial stability. Traditionally financial stability has meant preventing and managing financial crises (events which can lead to and exacerbate recessions). More recently it has come to mean heading off systemic risk (imbalances) and especially credit- driven asset price booms and busts which can trigger financial crises.

This paper examines the evolution of macroeconomic institutions focusing on the connection between the monetary regime (defined both as the exchange rate regime and the monetary policy regime) and financial stability in the past two centuries. This is primarily the story of central banks developing their policy tools to provide both macroeconomic and financial stability.

Central banks have evolved since the founding of the Swedish Riksbank in 1667 and the Bank of England in 1684. They were originally established to provide fiscal support to the governments of emerging nation states to finance wars. Later in the eighteenth and nineteenth centuries central banks evolved to maintain the convertibility of their notes into specie (gold) and to manage the gold standard. Because of their government charters and ample resources they became bankers banks for the nascent banking industry and lenders of last resort and protectors of the payments system. In the twentieth century they learned how to stabilize the business cycle and to provide

price stability. The central requirement of these tasks was the establishment of credibility. (Bordo and Siklos 2017a).

The evolution of central banks occurred within the context of the international exchange rate regimes which set the basic framework. These encompassed: the nineteenth century specie standard (bimetallism and gold); the interwar gold exchange standard; the Bretton Woods adjustable peg regime and the post Bretton Woods managed float fiat money regime.

In the international exchange rate regime, monetary authorities (central banks) adhere to a monetary policy regime. By a monetary policy regime is meant the relationship between the tools of monetary policy used and the goals or objectives of the policy maker. Historically monetary policy tools have been the policy interest rate, a tool used since the nineteenth century – monetary aggregates which were used in the twentieth century – and various qualitative and quantitative controls. Policy objectives or goals have historically been: stable exchange rates (gold convertibility pre – World War II), price level (inflation) stability; real output stability, low unemployment and financial stability.³ So for example under the classical gold standard monetary policy regime, when faced with a large gold outflow which threatened its reserves and its convertibility goal (mandate) the central bank would raise its policy rate (the discount rate).

The learning process to provide macroeconomic stability and to gain credibility was long and difficult. It followed a pendulum process of going from relative success to deep failure and back

³ Another important distinction is between a monetary policy strategy and a monetary policy regime. A monetary policy strategy is defined in terms of the goals of monetary policy (price stability (low inflation), low unemployment and financial stability). By contrast a monetary policy regime is characterized by the instruments used to achieve the strategy. For example, in recent decades the monetary strategy of Federal Reserve Chairmen Volcker and Greenspan was to attach greater importance to low inflation within the Fed's dual mandate whereas chairpersons Bernanke and Yellen attached more equal weight to inflation and unemployment in their strategies.

to success between the late nineteenth century and the end of the twentieth century (Bordo and Siklos 2014). The Great Moderation from the mid-1980s to the mid-2000s is often viewed as the pinnacle of success for central banks in achieving their macroeconomic goals (Bernanke (2004), Taylor 2010).

The learning process to provide financial stability has also been long and painful. Some central banks learned how to be effective lenders of last resort by the third quarter of the nineteenth century (Bordo and Siklos 2017b). For others it was well into the twentieth century. Until the 1930s, banking crises were banking panics which required quick lender of last resort actions to prevent a serious meltdown. After the invention of the financial safety net and deposit insurance banking panics evolved into fiscally resolved crises which have become increasingly expensive to resolve (Bordo and Meissner 2016). Along with crisis management, the regulatory and supervision regime for the financial system went through a lengthy learning process) (Toniolo and White 2015).

Four key objectives emerged from the historical evolution of central banks before the Global Financial Crisis of 2008 : a) the importance of maintaining price stability (credibility for low inflation); b) maintaining real macroeconomic stability; c) providing a credible rules based lender of last resort; d) having a sound banking structure and effective supervision and regulation of the banking system.

Since the Global Financial Crisis (GFC) of 2008 central banks have become focused increasingly on their financial stability mandate and especially the link between credit driven asset price booms and busts (referred to as the financial cycle) which many view as the key cause of financial crises (Borio 2014, Taylor 2012).

Stock market booms and busts and real estate booms and busts have always been present since the early days of capitalism. Most have been linked to real economic fundamentals—productivity

advances and demographic shifts. The view before the GFC was that central banks would be best advised not to prevent asset price booms and busts but to deal with their effects on the real economy later (referred to as the Greenspan doctrine or cleaning (see Brunnermeier and Schnabel 2016).

Since the GFC many have argued that central banks should use their monetary policy tools to head off such imbalances in advance (referred to as leaning against the wind policy (LAW)) (Stein 2013). In addition, many have advocated that central banks should use the tools of macro prudential policy (e.g. liquidity ratios, capital ratios, loan to value ratios, margin requirements) to prevent these imbalances from becoming serious (Borio 2014).

On the other hand, are those who argue that the central bank following such a strategy would conflict with its main goals of price level and real macro stability and encroach upon central bank credibility and even their independence (Goodfriend 2014, Svensson 2017). The relationship between monetary policy and financial stability is thus at the forefront of policy debate (Bordo 2017b). The lessons from economic history can be most helpful in resolving this debate.

In what follows I briefly survey the co-evolution of monetary policy and financial stability and the historical evidence on the incidence, costs and determinants of financial crises, combined with a narrative on some famous financial crises. I then focus on some empirical historical evidence on the relationships between credit booms, asset price booms and serious financial crises. My exploration suggests that financial crises have many causes, including credit driven asset price booms, which have become more prevalent in recent decades, but that in general financial crises are very heterogeneous and hard to categorize.

Two key historical examples stand out in the record of serious financial crises which were linked to credit driven asset price booms and busts: the 1920s and 30s and the GFC. The question that arises is whether these two ‘perfect storms’ should be grounds for permanent changes in the

monetary and financial environment. The paper concludes with lessons, both for policy makers and for future historians of the crucial subject of financial crises.

2. The Historical Evolution of Monetary and Financial Stability Policy

Central banks have evolved for close to four centuries. Their evolution was slow and often hit by setbacks. Central banks were initially established as private entities to meet the fiscal needs of nation states to finance government expenditures in wars and to market government debt, as in the case of the Riksbank in 1667 and the Bank of England in 1684. Later in the nineteenth centuries central banks followed their key mandate to maintain the convertibility of their notes into specie and to follow the ‘rules of the game’. Because of their government charters and large resources, they evolved into bankers’ banks and then into lenders of last resort to manage financial crises that boiled up in the first era of globalization.

During World War I they became subservient to governments and were turned into engines of inflation. In the interwar period they began to develop the tools of countercyclical stabilization policy and to insulate their economies from international shocks. In this period observance of the flawed real bills doctrine (in the US) and adherence to the flawed gold exchange standard led to serious policy errors and the Great Contraction of 1929-33. Central banks were blamed for the contraction. They lost their independence to follow an inflationary low interest policy to Treasuries and became an integral part of a regime of financial repression⁴.

In World War II central banks again became engines of inflation. Beginning in the 1950s central banks regained their independence and returned to using their policy tools to stem inflation and

⁴ See Reinhart and Sbrancia (2015) on financial repression. Central banks also became agents of the government’s industrial policy. See Capie (2010) on the Bank of England and Meltzer (2003) on the Federal Reserve.

stabilize the economy. In the 1960s central banks, strongly influenced by Keynesian ideas, began following the Phillips Curve tradeoff favoring maintaining high employment at the expense of increasing inflation (Meltzer 2010, Romer and Romer 2002). This led to the Great Inflation of the 1970s.

In the postwar era central banks also accepted their lender of last role after the debacle of the panics of the 1930s. However, they no longer followed Bagehot's strictures and began in 1974 to bail out insolvent banks believed to be "too big to fail".

The Great Inflation was ended in 1979 by the Volcker shock that brought the advanced countries into the Great Moderation (from the mid-1980s to the early 2000s), a period of rapid and stable growth and low inflation, Central banks had achieved the apex of their learning to follow credible rule like behavior (Taylor (2006)).

That ended with the Global Financial Crisis 2007-2008. It was handled much better than the Great Contraction by central bankers who had learned their lesson from the 1930s, but they and other regulatory authorities were blamed for not heading off the imbalances that led to the crisis. This in turn, like in the 1930s, has led to pressure for regime change to elevate the financial stability mandate to paramount importance and to a possible return to financial repression.

Following this brief overview, we examine in more detail below the evolution of monetary policy and financial stability regimes across historical exchange rate regimes.

2.1. The Classical Gold Standard

The specie standard evolved in the nineteenth century from bimetallism to the classical gold standard, which prevailed from 1880 to 1914. The gold standard rule was a contingent rule where temporary suspension and the issue of fiat money was permitted in well understood emergencies

such as wars and financial crises. Once the emergency ended the central bank was required to restore convertibility to gold at the official parity. If it did this it would ensure its credibility (Bordo and Kydland 1995). Credible adherence to the gold standard rule allowed central banks some leeway to conduct stabilization policies (smooth shocks to the price level, real output and interest rates) within the gold points (Bordo and Macdonald 2012).

In this era minimal attention was attached to smoothing the business cycle or reducing unemployment. Wages and prices were relatively flexible and the unemployed could always go to America and Australia.

The history of the pre-1914 gold standard shows how important countries, especially Britain, France, Germany and the United States (as well as smaller European countries: the Netherlands, Belgium, Switzerland and the Scandinavian countries) had credible regimes. Similar Western European countries like Italy, Spain and Portugal tried to gain credibility but were less successful as were all of the Latin American countries, reflecting their weaker institutional development (Bordo and Schwartz 1994).

Credible adherence to the gold standard rule also allowed central banks to conduct lender of last resort actions without engendering capital flight. During this era advanced countries learned through the trial and error of repeated financial crises to follow Bagehot's (1873) famous strictures 'in the face of an internal drain (a banking panic) lend freely to solvent financial institutions on the basis of sound collateral. In the face of an external drain (currency crisis) raise the policy rate. In the face of both an internal and external drain, lend freely at a high rate' (Bordo 1984, Flandreau and Ugolini 2013).

The evolution of LLR policies differed across Europe. In the UK case, on several occasions the Bank of England needed to invoke a Treasury letter permitting it to temporarily suspend gold

convertibility and increase its note issue. On the continent several central banks bailed out insolvent banks because they were deemed too big/and or important to fail (Grossman 2010). In France in 1889 and then England in 1890, the central banks developed lifeboat operations to save important financial institutions (White 2016). In the U.S. with no central bank since the demise of the Second Bank of the United States, part of the LLR role was filled by the advent of private clearing houses issuing clearing house loan certificates as substitutes for bank reserves (Timberlake (1984), Gorton and Tallman 2016).

Before 1914 financial crises were caused by internal and external shocks including political upheaval, corporate malfeasance by important financial institutions and international lending booms and busts. Crises were transmitted between countries by the adjustment mechanism of the fixed exchange rate gold standard. Their incidence and severity were closely related to both the presence and absence of a lender of last resort and institutional structure, especially bank structure – the US with unit banking fared far worse than neighboring Canada which had nationwide branch banking (Bordo, Redish and Rockoff 2015). Country differences in banking structure and government responses to financial crises were clearly tied in with deep institutional and political factors such as the nature/presence of property rights and rule of law and connection to the British Empire⁵ (Bordo and Meissner 2015, Calomiris and Haber 2014)

⁵ Indeed, the Federal Reserve System was founded in 1914 in response to banking crises. However, the Federal Reserve Act did not reform the inherently unstable US banking system, thereby putting more pressure on the lender of last resort when crises did occur (Bordo and Wheelock 2011)

2.2. The Interwar and World War II

World War I ended the classical gold standard. At the outbreak of hostilities in the summer of 1914 most of the belligerents suspended convertibility and imposed exchange and capital controls following a massive global financial crisis as they attempted to liquidate their vast foreign holdings of securities⁶ (Seabourne 1986, Silber 2005, Roberts 2013)). Every belligerent financed a considerable portion of their wartime expenditures with the issue of paper currency leading to high inflation. After the war many countries tried to rebuild the prewar gold standard system. Restoring the prewar parity after massive wartime inflation and changes in the political economy of the postwar order—the extension of the suffrage and the rise of organized labor, the decline of the European powers relative to the United States (Eichengreen 1992) –delayed the restoration of the gold standard, and the standard that was established –the fragile gold exchange standard had considerably less credibility (Bordo and Siklos 2014).

Britain returned to gold at the prewar parity in 1925 but at a significantly overvalued parity which continuously threatened its adherence (Bayoumi and Bordo 1998). France went through a period of political instability leading to high inflation and its central bank lost much of its credibility in a scandal before it restored convertibility in 1926 at a greatly undervalued parity (Bordo and Hautcoeur 2007). Germany suffered a hyperinflation fueled by the Reichsbank. The U.S. never left gold but the newly established Federal Reserve went through a lengthy learning period to become a fully functioning member of the gold club (Meltzer 2003).

By 1926 the gold exchange standard was up and running and its short-lived success depended upon the reputations of Benjamin Strong, Montagu Norman, Emile Moreau and Hjalmar Schacht

⁶ In the US the issuance of emergency currency prevented a banking panic. In the UK the Bank of England engaged in a massive lender of last resort operation.

(Ahamed 2009, Bordo and Schenk 2016). Despite their efforts the system collapsed during the Great Depression. It suffered from the fatal flaws of maladjustment, illiquidity and lack of credibility. The key problem was adjustment as the UK had restored convertibility at an overvalued parity and faced continuous deflationary pressure while France restored convertibility at a greatly overvalued parity. Both France and the United States sterilized gold inflows aggravating the deflationary pressure on sterling, a declining reserve currency (Eichengreen and Flandreau 2014). During this period many central banks began following macro stabilization policies to offset fluctuations in the price level and real output. To do so required sterilizing gold flows and preventing the classical adjustment mechanism from working. This was different from the pre-war gold standard. These sterilization policies led to the ultimate breakdown of the international monetary system (Meltzer 2003).

Financial stability also suffered in the interwar as most European countries in the 1920s , in the face of deflation and readjustment of competitiveness, suffered banking crises , most of which were not resolved by effective LLR policies (Feinstein, Temin and Toniolo (1997)) . A number of countries resorted to fiscal bailouts of banks deemed ‘Too big to fail’ during this period (Toniolo and White 2015).

The Great Contraction of 1929 to 1933 in large part reflected policies by central banks (Ahamed 2009) and most particularly the Federal Reserve which followed the flawed real bills doctrine (Meltzer 2003, Wheelock 1992)) which led the Federal Reserve to tighten monetary policy in 1928 to prick the Wall Street stock market boom. The boom itself some argue may have been fueled by loose monetary policy in 1926 to aid the UK in its struggles to stay on the gold standard⁷.

⁷ There is considerable debate over this issue. Adolph Miller, Chairman of the Federal Reserve blamed the Wall Street Boom and Crash and the Great Depression on Benjamin Strong for his

Moreover, the gold exchange standard may have contributed to the lending boom that accompanied the productivity driven stock market boom by allowing the money supply to be more elastic than was the case under the classical gold standard (Eichengreen and Mitchener 2004).

The Fed's policy actions were unsuccessful in deflating the boom but did lead to a serious recession in the summer of 1929. An even more egregious error was the System's failure to follow its lender of last resort mandate and offset a series of ever worsening liquidity driven banking panics from 1930 to 1933 (Bordo and Wheelock 2011, Bordo and Landon-Lane 2010). This caused a collapse by one third in the money supply and a similar collapse in real output and prices and a rise in unemployment to 25%. (Friedman and Schwartz 1963).

The U.S. Great Contraction spread to the rest of the world through the fixed exchange rate gold standard. Serious policy errors were also made by the German Reichsbank and fiscal authorities (trapped by the fixed exchange rate gold standard imposed upon them by the international authorities in the Dawes plan and the 1924 London Conference) by tightening monetary and fiscal policy as the depression spread to Germany (James 1986). The loss of credibility in the interwar in turn aggravated matters for most European countries who, faced with "golden fetters" were unable to follow successful LLR policies to prevent banking panics and deflation (Eichengreen 1992, Bernanke and James 1991). They only escaped the depression by cutting the link with gold and devaluing their currencies (Choudhri and Kochin (1980), Eichengreen and Sachs (1986)) .

The Great Contraction led country after country to raise tariffs, impose exchange and capital controls in an effort to protect their economies from foreign competition Kindleberger(1973), Irwin (2011). They also followed beggar thy neighbor competitive devaluations (currency wars)

actions to save sterling. Miller was supported by Carter Glass and Herbert Hoover. Friedman and Schwartz (1963) and Meltzer (2003) were skeptical of this charge.

(Nurkse 1944). The outcome was by the eve of World War II the complete collapse of the global trade and international financial system.

In the U.S. and other advanced countries, the Great Contraction was blamed on the central bank and the commercial banks. This led to the subservience of the Fed to the U.S. Treasury from the mid-1930s until 1951 when the Fed began following a low interest rate policy to accommodate the Treasury's fiscal policy (Meltzer 2003). During World War II the Fed became an engine of inflation as had been the case in World War I. The story was similar in the UK, Canada and many other countries. Central banks lost their independence, administered controls over the financial system and became part of the general machinery of credit allocation and financial repression.

2.3. Bretton Woods 1944 to 1973

The Bretton Woods System (BWS) inaugurated at the Bretton Woods conference in 1944 created an environment to restore both macroeconomic and financial stability (Bordo 1993, Bordo 2017a). BWS was rule based, in a number of ways similar to the gold standard. Each member was required to peg their currencies into dollars at \$35 per ounce and the U.S. as key anchor currency was to use its financial policies to maintain the dollar peg. It was an adjustable peg whereby member countries could change their parities in the face of a 'fundamental disequilibrium' (a change in the real exchange rate). In addition, capital controls were instituted. Unlike the gold standard, members were expected to use their monetary and fiscal policies to maintain full employment. The IMF was established to provide temporary relief for current account imbalances.

The Bretton Woods system became fully operational in late 1958 when the Western European economies declared current account convertibility. The convertible Bretton Woods System was associated with remarkable macroeconomic stability—rapid real growth and relatively low real

income variability and relatively stable and low inflation (Bordo 1993). But the BWS was short-lived and quickly evolved into the gold dollar standard which had the fatal flaws of the interwar gold exchange standard.

The key problem was adjustment as in the 1920's. The UK with an overvalued parity and slower growth than its competitors and the inability to accept deflation had continuous balance of payments deficits and currency crises and rescues by the G 10, the IMF and the U.S. On the other hand, Germany with rapid productivity growth ran continuous surpluses but as in the interwar , was unwilling to let prices rise and sterilized the inflows. The U.S. as anchor country ran continuous balance of payments deficits as the dollar was used as international reserves to finance the growth of world trade. It did not have to adjust to its deficits. As outstanding dollar balances increased relative to the US monetary gold stock the threat of a run on the bank (Fort Knox) loomed. In reaction the US authorities created an elaborate set of policies and controls (the most important of which were the swap lines) to preserve the monetary gold stock (Bordo, Humpage and Schwartz 2015). However as long as the US monetary authorities followed credible low inflation policies the system would continue because the dollar had emerged as the key international currency. The BWS only collapsed in 1971 after the US began following inflationary monetary and fiscal policies in 1965 to finance the Vietnam war and LBJ's Great Society.

Within this international background the Federal Reserve slowly regained its independence from the Treasury. The interest rate pegs were kept after World War II and in the 1940s inflation became endemic leading the Fed to try to regain its independence to raise its policy rates. This was achieved after a considerable struggle with the Treasury and the administration in the Federal Reserve Treasury Accord of 1951. Other countries took much longer to regain their independence, often into the 1980s and early 1990s.

The Fed tightened policy in the early 1950s and restored price stability. Under Chairman Martin the Fed followed a policy of low inflation and the economy (as in the rest of the world) ,performed well through much of the 1950s and early 1960s. The return to monetary orthodoxy rested on the reputation of Chairman Martin. Two other central banks in this period , the Bundesbank and the Swiss National Bank, also followed credible monetary policies.

The Bretton Woods era was also associated with financial stability. The controls on the financial industry and the regime of financial repression continued into the 1950s and 1960s. In the US regulation Q which imposed a ceiling on time deposit interest rates and prohibited the payment of interest was administered by the Federal Reserve System. Another important regulations was the Glass Steagall separation of commercial from investment banking. In the face of those regulations and the extension of FDIC deposit insurance there were no financial crises in this era(other than currency crises) –speculative attacks on pegged exchange rates). Similar policies and institutions prevailed in the UK and virtually every other advanced country (Toniolo and White 2015).

2.4. The Managed Float Regime 1973 to 2006

The era of macro stability and financial stability was short-lived and began to unravel in the mid 1970s. In the 1960s central banks (with the exceptions of the Bundesbank and the SNB) began following Keynesian policies to maintain full employment at the expense of higher inflation. With the collapse of Bretton Woods and the (indirect) link to gold there were no constraints on monetary policy. The subsequent Great Inflation destroyed credibility, as well as the reputations of central bankers such as Arthur Burns (Bordo and Orphanides 2013, Bordo and Siklos 2015).

As inflation and inflationary pressures mounted in the 1970s several attempts by Chairman Arthur Burns and the FOMC to reduce inflation faltered when it led to recession and rising

unemployment, leading to a ratcheting up in inflation and inflation expectations. Accommodation of two oil price shocks also contributed to the run up in inflation. By the late 1970s the Fed had lost considerable credibility for low inflation culminating in a run on the dollar in 1978. President Carter's appointment of Paul Volcker as chairman of the Fed with a mandate to end inflation and his adoption of monetarist style tight monetary policy broke the back of inflationary expectations at the end of a deep recession (Bordo, Erceg , Levin Michaels 2017). Only a form of 'shock therapy' could restore low long-run inflationary expectations. (Levin and Taylor 2013).

Similar strategies were followed in the UK, Japan, Canada and other countries so that by the mid 1980s, the Great Moderation restored price stability along with the reputations of central bankers. During the Great Moderation period central banks developed new strategies which enhanced their credibility (Bordo and Siklos 2014 and 2017b). Chief amongst these is inflation targeting (IT) developed in the late 1980s and early 1990s by New Zealand , Canada , Australia, the UK and Sweden. It proved to be most successful in improving inflation performance in the countries that adopted it.

As it was practiced it became flexible inflation targeting. Under flexible IT the policy interest rate is used to hit the explicit inflation target (e.g. 2%). But since changes in the policy stance influence inflation with long and variable lags there is usually a tolerance range around the mid- point of the target. Flexible IT allows the central bank to influence its other main macroeconomic goal of low unemployment (follow the dual mandate) as well as achieve their mandated inflation target (King 1997 Svensson 2009).⁸

⁸ Flexible IT has some resonance to the story of central banks under the classical gold standard who could temporarily follow stabilization policy within the gold points yet maintain gold convertibility (Bordo and MacDonald 2003).

The end of the Bretton Woods system also led to the breakdown of financial stability. A number of forces were at work. One of the reasons that Bretton Woods failed was because it became increasingly more difficult to maintain capital controls in the face of financial innovations (e.g. Eurodollars) (Bordo 1993). Once capital controls fell by the wayside private capital flows, in addition to contributing to a return to financial globalization, also increased the likelihood of both currency crises and banking crises driven by lending booms and sudden stops (Bordo, Taylor and Williamson 2003). A second reason is that the Great Inflation made it more difficult for the various price controls in the financial sector in various countries to be maintained. In the U.S. high inflation led to the ending of regulation Q and also contributed to the Savings and Loan crisis in the 1980s as these institutions, which intermediated between low interest deposits and fixed rate mortgages, eventually collapsed (Toniolo and White 2015). With inflation came increasing financial innovation and competition between new institutions (designed to evade the controls) and the older protected ones. Political pressure in the 1980s and 90s led to the complete liberalization of the financial sector in the US by 1999 with the elimination of Glass Steagall and the end of the prohibition on interstate branch banking in 1997. At the same time the supervision and regulation regime failed to keep up with the rapid changes brought about by financial liberalization. The same process unfolded across the world albeit under different institutional frameworks.

Banking crises which had virtually disappeared since the mid-1930s came back in the 1970s with the opening up of finance. In the U.S. after the debacle of the Great Depression the Fed acknowledged its lender of last resort role in the post war period. With the return of banking crises in the 1970s the Fed began following activist crisis management policies (Bordo 2014, Carlson and Wheelock 2015).

Banking crises in this period were very different from those in the 1930s and earlier. With the advent of deposit insurance, old fashioned banking panics disappeared and were replaced by expensive fiscal bailouts of insolvent firms. Also the Fed expanded its reach beyond the traditional ‘line in the sand’ of only protecting the deposit taking institutions and the payments system, and began to allay turmoil in the non- banking sector (e.g. Penn Central in 1970 and much later the investment banks in 2008).

A key event was the bailout of Franklin National bank which had made risky bets in the foreign exchange market. The justification for this violation of Bagehot’s strictures was to prevent contagion to other banks. This was followed by the bailout (by the FDIC) in 1984 of the insolvent Continental Illinois bank, the eighth largest commercial bank in the US on the grounds that it was too big to fail. A subsequent event was the lifeboat operation arranged by the New York Fed of LTCM, a hedge fund, which had made a disastrous bet on Russian sovereign debt.

In some ways the rescue resembled a life boat operation arranged by the Bank of England in 1890 to save Barings and prevent a banking panic (White 2016). LTCM was rescued on the grounds that not to do so would lead to large losses to unknown counterparties.

The Fed in this period moved away from Bagehot’s dictum to not rescue insolvent banks. Bagehot was criticized by Goodhart (1985), Solow (1982) and others on the grounds that it was not possible to distinguish illiquidity from insolvency during a crisis and that the failure of a large bank would disrupt financial intermediation and lead to contagion. This led to the Fed’s adoption of the “Too Big to Fail” doctrine⁹. In response to the concern over moral hazard, Corrigan (1990), Giannini (1999) and others suggested that the Fed follow a strategy of “constructive ambiguity” by not declaring in advance which banks would be deemed large enough to save.

⁹ Along with the FDIC and the Treasury.

Similar processes went on in the UK in this period (Capie 2010 and James 2017) as well as in other countries. These developments set the stage for the return of serious financial instability in advanced countries in the 2007-2008 subprime mortgage crisis.

2.5. The Global Financial Crisis

The Great Moderation of 1985 to 2005 was associated both with macroeconomic and financial stability. The prevalent view at the time was that monetary/price stability fostered financial stability because inflation volatility weakened bank balance sheets (Bordo 2000, Bordo, Dueker and Wheelock 2002). The alternative view of the BIS was that extended periods of low inflation and low interest rates created growing imbalances (Borio and Lowe 2002). That is, low interest rates and low inflation were conducive to creating bank credit fueled asset price booms and busts. These would occur because low interest rates created the seeds for credit financed asset price booms in an environment of price stability. At the end of the Tech boom of the 1990s and the early 2000s BIS officials suggested conditions under which the Fed should raise its policy rates to defuse an incipient bubble (BIS 2000). Federal Reserve officials and some prominent economists (Greenspan(2002), Bernanke and Gertler 1999) argued that the proper way to treat an asset price boom was to leave it alone and if it burst to clean up the mess afterwards(“cleaning”, Brunnermeier and Schnabel 2016).¹⁰

¹⁰ Bordo and Jeanne (2002) posited that if there was perceived to be a high probability that an asset boom would burst and lead to a serious recession that the central bank should use its policy tools to head off the bust. They were agnostic on whether the central bank should use its policy rate or other tools like margin requirements.

As it turned out when the Tech boom burst in 2000 it did little damage to the real economy justifying the Fed's view. The BIS proponents argued that it did not cause much real damage because it was financed largely with equity and not by bank credit.

The 2007-2008 subprime mortgage crisis, by contrast, did have serious effects on the global financial system reminiscent of 1931 and led to a very serious recession. The BIS argued that the housing bust in the U.S. was exactly what it predicted because it was driven by an expansion of bank credit in an environment of abnormally low interest rates (Borio 2014).

The debate over the causes of the 2007-2008 crisis continues. Many factors were at work including regulatory policies in the U.S. housing sector (Fanny Mae and Freddie Mac) that encouraged risky mortgage borrowing (Rajan 2010, Poole 2016), the fact that the Fed (and other central banks) kept its policy rate well below the Taylor Rule rate from 2002-2005 because of a fear of a Japan style deflation(Taylor 2007, Lane 2016); financial innovation that created derivatives ;the failure of US and other regulators from comprehending that their regulations of the global banking system were being evaded by the creation of off balance sheet entities like SIVs and the shadow banking system(Gorton 2010, Calomiris 2017); a global savings glut (Bernanke 2005) and greed and malfeasance by many financial sector players.

The crisis was eventually managed and the macro economy was stabilized by the policy actions by the Fed and other central banks and by international policy coordination. The central banks pursued classic Bagehot liquidity policies but extended their discount window mandate to encompass non- bank financial intermediaries (shadow banks)¹¹. The monetary and fiscal authorities also bailed out insolvent banks and investment banks deemed 'too important to fail'

¹¹ Some commentators (e.g. Orphanides 2016)) have emphasized that the central banks took on too many responsibilities during the GFC and as a consequence have lost focus on their main mandate which is the pursuit of price stability.

(SIFIs). Central banks independence was violated by the use of credit policy which is a form of fiscal policy (Goodfriend 2014). Because they engaged in credit policy and bailed out insolvent banks their future independence is threatened by legislative reaction in the U.S. and other countries.

Indeed as in the 1930s, the GFC was blamed on the banks and the financial sector in general leading to a considerable increase in financial regulation (Dodd Frank 2010) which many believe has greatly restricted the scope of the financial sector. At the global level, the Financial Stability Board began implementing new regulations under Basel III. In addition, the central banks have been urged to use their policy tools to head off incipient systemic risk and especially credit booms. They have also been entrusted with the new (many of which were used 60 years ago) policy tools of macro prudential policy to deal with potential financial instability¹². This increased emphasis on financial stability has created a sense of déjà vu from the 1930s when the New Deal financial actions (and similar initiatives abroad) led to a regime of financial repression which in subsequent decades had serious unintended consequences.

3. Financial crises in Historical Perspective: Measurement

Interest in the incidence and history of financial crises has increased markedly since the GFC. To clearly understand the link between the monetary policy and financial stability regimes, it is crucial to understand the record of the most extreme form of financial instability—financial crises. In this section we review the historical evidence on the incidence, determinants and costs of financial crises. Our survey suggests that not only has the crisis problem returned with a vengeance in the

¹² This raises the issue of who should implement these policies, the central bank or another agency e.g. a Financial Stability Authority as in Canada or Australia. See Svensson 2015)

second era of globalization since 1973 to rival its presence in the first era of globalization before World War I, but the output costs have been rising in recent years closer to what was seen during the interwar period. These facts help to explain why the emphasis on financial stability has become so prominent. We also consider the evidence on the determinants of financial crises. The current consensus view is that financial crises are caused by credit driven asset price booms . Our overview suggest that while this is an important cause of crises it is not the only one. Indeed, the historical experience suggests that financial crises are very heterogeneous. Before we present this evidence we briefly lay out some definitions of financial crises and closely related phenomena.

3.1. Definitions

The original definition of a financial crisis was a banking panic—a scramble by the public for means of payment (Schwartz 1986). It occurred in two historical scenarios. The first was a contagious banking panic, when the public fearful that their banks would not be able to convert their deposits into currency attempted to do so en masse. The second was a stock market crash that led to fears that loans from banks to brokers would be unavailable at any price . Without intervention by the monetary authorities or lender of last resort—through open market operations or liberal discount window lending—the real economy would be impacted by a decline in the money supply, by impairment of the payments system , and by an interruption in bank lending.

In the post- World War II era, with the widespread adoption of government guarantees including deposit insurance (both explicit and implicit) and with the understanding of the role of a lender of last resort, old fashioned banking panics have become quite rare events. Instead banking crises largely involve the insolvency of the banking system or of systemically important financial institutions (SIFIs). They have occurred when asset prices have plunged, whether the prices of

equities, real estate or commodities; when the exchange value of a national currency experiences substantial depreciation; when a large financial or non- financial firm faces bankruptcy, or a sovereign debt default (Kindleberger 1978).

Unlike banking panics which are brief episodes resolved by the central bank, a banking crisis is a prolonged disturbance that is resolved by government agencies (the fiscal authorities) other than the lender of last resort, although at some stage it may supply liquidity to the market through the discount window or open market operations. Bordo and Meissner (2016) document how the increasing use of government guarantees has increasingly linked banking crises with fiscal crises. Other events referred to as financial crises can also impinge on banking crises; a) currency crises which are speculative attacks on the exchange value of a currency under a pegged exchange rate. Currency crises can occur along with banking crises referred to as twin crises. Such events are always worse than single crises (Reinhart and Kaminsky 1999); b) sovereign debt crises which arise when the fiscal authorities are unable to raise sufficient tax revenues in the present and the future to service and amortize the debt. A debt crisis can thus become a financial crisis when it impinges on the banking system and a currency crisis when it threatens the reserves of the central bank. Banking crises can feed into debt crises when the fiscal authorities bail out insolvent banks which then increase sovereign debt to the point where it becomes unsustainable , as was the case in the Eurozone crisis 2010-2013.

Related non crisis phenomena can trigger or exacerbate financial crises. Credit driven asset price booms can trigger banking crises because as these booms turn into busts they damage the balance sheets of the private sector and the banking system often leading to bank insolvencies. In addition when banks are hit by collapsing asset prices and tight monetary policy they can cut their lending severely (referred to as a credit crunch) precipitating a drop in real activity. Resulting private

sector insolvencies can feed back into the banking system leading to more financial institution insolvencies and a crisis.

Moreover sudden stops can precipitate financial crises (Bordo, Cavallo and Meissner 2010). Lenders can suddenly cut off capital flows to emerging country borrowers reflecting adverse news about the borrower or shocks from the financial center (London). Sudden stops can precipitate banking, currency and debt crises in borrowing countries.

The last phenomenon that can contribute heavily to severe financial crises is contagion. Bank runs can spread between banks affected by the same bad fundamental. There can be pure contagion in which depositors stage a run on otherwise solvent banks driven by a general rush to liquidity. Contagion can spread between countries as well (Bordo and Murshid 2001).

3.2. The Incidence of Financial Crises

There has been considerable research on measuring the incidence since the nineteenth century of financial crises. Bordo and Meissner (2016) surveyed this research by a number of scholars: Bordo, Eichengreen, Klingebiel and Martinez –Peria (2001); Reinhart and Rogoff (2009), Jordà, Schularick and Taylor (2011) and Laeven and Valencia (2013).

Figure 1 shows the frequencies of banking crises for the different data bases.¹³ Bordo and Meissner (2016) discuss some of the measurement issues in comparing the different data bases that use different definitions of crises and different samples of countries. Bordo et al (2001) cover 21 countries 1880-1997; Reinhart and Rogoff's data base begins with the beginning of the nineteenth

¹³ Bordo and Meissner (2016) also present similar calculations for currency crises, debt crises, twin crises and triple crises.

century for a few countries and then increases in size to 76 countries; Jorda et al (2011) cover 17 countries 1870 to 2011; and Laeven and Valencia (2013) cover 162 countries 1970 to 2012.

We calculate crisis frequencies as the ratio of years in which the set of countries in the sample is in the first year of a banking crisis to the total number of years. We compare outcomes across four different time periods: the classical gold standard 1880-1913; the interwar period 1919-1939; Bretton Woods 1945 to 1972; the current period of managed floating 1973 to the present.

As can be seen , adjusting for the differences in the sample sizes for the different data bases the incidence of banking crises was quite similar in the pre-1914 gold standard era (which was also the first era of globalization, Bordo, Taylor and Williamson 2003) with the post 1973 period (the second era of globalization). Bordo et al (2001) referred to this phenomenon as ‘going back to the future’. The incidence of banking crises is much higher in the unstable interwar period and is almost nonexistent in the Bretton Woods era of financial repression.

3.3. Global Financial Crises

Over the close to two centuries of data a number of the financial crises are global. They occurred in many countries across continents. Kindleberger (1978) was the first to identify this phenomenon. Global financial crises occurred in the environment of globalization with free capital mobility and the gold standard fixed exchange rate regime. Since the reemergence of financial globalization in the 1970s (Obstfeld and Taylor 2007) international financial crises have reappeared.

A global financial crisis occurs when shocks to the banking system in one country are transmitted to another country or when stock market crashes are linked among countries leading to impairment of the payments mechanism. Historically they were transmitted through the balance of trade

adjustment channel of the classical price specie flow mechanism, through capital flows, and other channels including foreign deposits (Huffman and Lothian 1984 , Eichengreen and Portes 1989). Currency crises also can be global and they in turn can lead to or be caused by banking crises. They can be transmitted through fundamentals (the effects of depreciating exchange rates on competitors current accounts and the pursuit of similar macro policies). Another channel is through contagion where transmission occurs independent of fundamentals.

Bordo and Landon-Lane (2010) defined a series of crisis events to be a global crisis and identify global financial crises using the Bordo et al (2001) data base.¹⁴ Figure 2 shows the weighted two period moving sum of banking crises 1880-2009. They identified five global banking crises : 1890-91;1907-1908;1913-1914, 1931 -32 and 2007-2008. Table 1 shows the countries involved. The historical events demarcated are very close to those identified by Kindleberger (1978). A number of other events that others have discussed, like the Latin American debt crisis of the 1980s, did not satisfy our criteria.

3.4. Output Losses from Financial Crises

A key reason why financial crises are deemed so important is that they often lead to large output losses. An extensive literature which was surveyed by Bordo and Meissner (2016) has been devoted to measuring the output losses of financial crises. Issues of measurement, and endogeneity dominated the debate. They calculated unconditional output losses in different periods using the crisis dates from the various data sets that they surveyed. The metric used is the cumulative

¹⁴ They defined a period to be a global crisis : 1) if a period is a local peak of a two year moving sum; 2) the local peak is an extreme value if a) the weighted sum of the total crisis is more than three standard deviations from the mean, b) the crisis is considered large and if it is in the upper tail of the distribution and has a combined weight that is greater than the output of the U.S. ; 3) the countries involved come from more than one continent.

percentage deviation of GDP per capita from the pre-crisis trend level of per capita GDP. They use a window from the year of the crisis to three years after it starts. Pre-crisis trends are based on the average annual change of the log of per capita GDP up to 10 years prior to the crisis.

Figure 3 shows the output losses for banking crises for the four historical periods using all of the data bases. Also shown are the losses up to 2012 consistent with the Bordo et al (2001) data which ended in 1997 from the Laeven and Valencia (2013) study. In the pre-1914 era the losses ranged from 3% to 6% of GDP. For the interwar period, driven by the Great Depression they are much larger—40%. In the post Bretton Woods period losses are smaller than the interwar but larger than under the gold standard.

An interesting phenomenon is that output losses in the recent period since 1997 are much larger than in the pre-1914 period despite today's greater reliance on lender of last resort policies and other policies designed to remedy the market failures associated with financial shocks. This may be explained by the fact that in recent years banking crises in a regime of government guarantees are associated with ever higher fiscal resolution costs (Bordo and Meissner 2016). The upshot of the evidence is that the stakes associated with financial crises have been higher and hence the imperative for monetary authorities to prevent them has increased.¹⁵

3.5. The Determinants of Financial Crises

The evidence on the determinants of banking crises does not point to any one single factor as being paramount. A meta study of the recent literature by Bordo and Meissner (2016) points to the

¹⁵ Bordo and Landon-Lane (2010) calculated the output losses associated with their five global financial crises. The greatest losses for the averages of all the countries involved occurred in 1930-31 followed by 1913-1914 and then 1890-91. 1907-1908 and 2007-2008 were the lowest at less than 5%.

conclusion that not all banking crises are driven by credit booms as is emphasized today (Borio and Dreheman 2009, Jordà, Schularick and Taylor 2016b, Brunnermeier and Schnabel 2016). Also, not all housing and equity booms end in busts contributing to crises as is also recently posited (see Bordo and Landon-Lane 2013a and 2013b, and Mishkin and White 2014).

Many of the studies using various techniques to predict banking crises find that financial sector liberalization in environments with weak regulatory capacity are important. Other studies emphasize current account deficits and capital inflows which contribute to twin crises. Still others, focusing primarily on the past three decades, emphasize the growth of the ratio of credit to GDP (Jordà, Schularick and Taylor 2011). A number of studies of banking crises emphasize the absence of a central bank, weak bank structure (unit versus branch banking), financial innovation, poor regulation and supervision, weak property rights and failure to follow the rule of law and more volatile emerging economies subject to shocks. Of key importance across time is the role of the lender of last resort. Absent that function financial crises became much worse.

In sum the determinants of banking crises are varied. No one factor dominates across all countries and time. The fact that some of the recent crises have been associated with credit driven asset price booms does not necessarily imply that all future crises will be.

4. Financial Crises in Historical Perspective: Narratives

Financial crises have been with us since the dawn of capitalism. The circumstances in which they have arisen varied considerably. Some of these crises were associated with credit driven asset price booms as is emphasized today. Others were not. Some were twin crises and some were global financial crises. The historical pattern of financial crises is very heterogeneous.

We present brief narratives on twelve very important and serious financial crises in the past two centuries.¹⁶ These 12 are only a subset of the crisis record in the existing data bases. We first discuss some famous British crises , then crises from the US, and then other countries.¹⁷ Table 2 summarizes the narratives and provides some salient characteristics for each episode on: the severity of each crisis, whether it was part of a global crisis, the exchange rate regime in place , whether it was accompanied by a currency crisis , whether it was associated with a credit boom, whether a central bank was in place, whether it was allayed by lender of last resort actions, whether it was fiscally resolved and the type of banking structure in place. See Appendix I.

As can be seen from the narratives, the environment in which crises occurred evolved from the classical gold standard to the interwar gold exchange standard to Bretton Woods and the post-World War II Managed Float. The key causes involved both domestic and external shocks (sudden stops) , weak banking structure and supervision and regulation, lending booms and busts, some driven by bank credit, others by foreign bond and equity capital inflows and financial innovation. Above all the key ingredient in how a crisis played out was the presence or absence or failure of the monetary authorities provision of the lender of last resort. In the past two decades a key player has been the fiscal authorities because with the advent of the financial sector safety net and government guarantees banking panics have morphed into fiscal crises which have become very costly.

¹⁶ My narratives are based on decades of studying financial crisis lore. I was strongly influenced by my thesis advisor at the University of Chicago, Milton Friedman and later by collaborating with Anna Schwartz for 40 years. Other classics like Juglar (1856), Mitchell (1913), Kindleberger (1978), Sprague (1910) and Kemmerer (1912) were grist for the mill.

¹⁷ Other crises narratives are in Bordo and Eichengreen (1999) and Brunnermeier and Schnable (2016)

Credit driven asset price booms , the cause of financial crises which has been emphasized since the 2007-2008 crisis, were important in a few big crises before World War II but not the majority. Since the collapse of Bretton Woods and the return of financial globalization and the liberalization of the domestic financial sector in every country, financial instability has returned. Since the 1970s major financial innovation has allowed banks to fund themselves in the financial markets and not have to rely on their deposit bases (Schularick and Taylor 2012). This has allowed bank credit to grow faster than the money supply , has increased leverage, and may have been a key factor triggering asset price booms and possible financial crises since the 1980s.

In addition, financial innovation, made possible by the growth of financial theory and financial innovation, has led to the growth of non- bank financial intermediaries (shadow banks) which are outside the traditional supervisory and regulatory networks. These innovations both in the traditional banking sector and the shadow banking sector have increased both leverage and liquidity in the financial system. This has created a new source of systemic risk which can increase financial instability.

5. Credit booms, Asset Price Booms and Financial Crises

The current consensus view among economists and policy makers is that credit driven asset price booms are the key cause of serious financial crises. As my Appendix narrative has shown, there were major credit booms that led to financial crises before World War II but that most crises were not driven by them. They have become more important since the post Bretton Woods liberalization of the domestic and global financial systems.

To provide some empirical perspective on the issue of the relationship between credit booms , asset price booms and financial crises associated with deep recessions I examined, using a business

cycle methodology, the evidence for a sample of 15 advanced countries from 1880 to the present. Answers to several questions are of interest: 1) what is the incidence of credit booms associated with banking crises? More specifically do they peak slightly before or are coincident with banking crises? 2) what is the incidence of equity boom busts and housing price boom busts associated with banking crises, more specifically do they occur shortly before or coincident with serious banking crises? 3) what is the relationship between these types of events and banking crises associated with severe recessions? These questions relate to a key motivation for why central banks today are so keen on using financial stability policy to prevent these events before they happen.

The methodology used to identify credit cycles and asset price boom busts comes from the business cycle dating literature and has been used before in several of my earlier articles with John Landon-Lane.¹⁸

To identify a credit boom we use the approach taken by Gorton and Ordoñez (2016).¹⁹ They define a good credit boom as one that is related to the growth of total productivity such as occurred with the adoption of railroads in the nineteenth century, electricity in the early twentieth century and

¹⁸ The approach taken here to measuring the impact of credit differs from the local projections technique used by Jordà et al in several papers (2011,2013,2016 a,b). Their work leads to the conclusion that credit is the key determinant of financial crises over the long run. The approach I use is simple and does not make any assumptions about homogeneity of cycles over time and across countries. I take the raw data and find the turning points using an established data algorithm (Bry and Boschan 1971) as used by Harding and Pagan (2002). The data is not manipulated in any way by passing it through a smoother (e.g. Hodrick Prescott) or by imposing any econometric model. Approaches such as Jordà et al make some assumptions. The panel assumption they use assumes some homogeneity across countries. Their model is non-linear in that the impulse response function is a non-linear function of the data. My conjecture is that a few big outliers are driving their results. I find evidence similar to their conclusions for a small number of countries and periods but not for the majority of periods and countries. Any panel econometric analysis assumes that the model applies to all observations and all countries. Our results suggest that the panel assumption may not be valid. It also casts doubt as to whether all cycles are the same.

¹⁹ For a critique see Richter et al (2017).

the internet in the late twentieth century tech boom. A bad credit boom is one that ends in a banking crisis and in which the underlying technical innovation did not pan out.²⁰

Two annual data bases for the ratio of credit to nominal GDP are used : a) total loans divided by GDP for the period 1880 to 2010 for 15 advanced countries which comes from the Jordà, Schularick and Taylor web data base (2017); b) the annual data used by Gorton and Ordonez , domestic credit to the private sector divided by GDP, which comes from the World Bank Macro data set for the same group of countries. This variable is defined as the financial resources provided to the private sector , such as loans, purchases of non-equity securities, trade credit and other accounts receivables that establish a claim for repayment. The credit cycles calculated are in the Web Appendix II.

Figure 4 compares the dates of banking crises (first year) from the Bordo and Meissner (2016) chronology with the peak year of credit booms using the loans to GDP definition. Table 3 shows the frequency of banking crises and credit booms. We distinguish between the number of credit booms within one year of a banking crisis and the number of credit booms which peak one year before or coincident with a crisis to get a rough idea about causality, since the former group includes episodes where booms peaked after a crisis.

As can be seen the percentage of credit boom peaks within one year of a crisis is 22.6%, while the percentage one year before or in the same year is only 7.5%. Pre-World War I credit booms are associated with a crisis in Australia in 1893; in the interwar Norway in 1921 and in 1930 the US

²⁰ The Gorton-Ordoñez identification rule is that a credit boom starts with three periods of growth that averages more than 5% per year and that ends with two periods of negative growth. I first identify expansions, then check to see if at any time during that expansion there is a three-year span where growth is higher than 5% on average. Then I check if the subsequent period has two periods of negative growth. Under this approach, expansions that are shorter than three periods do not count and contractions that do not have credit declining for the first two periods are ruled out.

and four other countries; in the post Bretton Woods period Japan, Sweden and Finland; and in the GFC the UK, Italy and Denmark.

Figure 5 combines the loans to GDP data set with the credit to GDP data and does the same comparison. The coincidence between credit booms and crises is slightly lower than in figure 4 with 13.2 % of credit booms within one year of a crisis and 3.7% with credit booms peaking one year before or coincident with a crisis. The credit data picks up a few more countries viz during the GFC , the US, Sweden, Belgium and the Netherlands.

Finally, I compare credit booms to major financial crises defined as crises associated with a 5% drop in real GDP. Figure 6 shows this comparison. From Table 4 we see that the percentage of credit boom peaks associated with crises is much lower than in the previous figures at 3.7% and the percentage of credit booms that precede or occur in the same year is even lower at 2.6%.²¹

These results are quite dramatic. They suggest that credit boom induced big crises like the Great Contraction or the GFC are very rare—about once in every 50 years. It raises the question whether there should be a major financial stability policy regime change if these events are so rare?

I next compare asset price boom busts (house prices and equities) with all banking crises. My measures of asset price boom busts comes from Bordo and Landon-Lane (2013a,b). They only cover the period 1900 to 2010. See figure 7 for housing boom busts. From Table 5 it can be seen that 26% of housing boom peaks occur within one year of a banking crisis and 26% of housing boom peaks occur one year before or coincident with a banking crisis. Figure 8 compares stock market booms with crises. Here the connection is much lower. Only 7% of stock market peaks

²¹ In addition a number of credit booms occur after serious banking crises. This may reflect the fact that after a crisis with many bank failures that bank lending and the extension of credit collapses.

occur within one year of a crisis and 7% of stock market booms peaks one year before a crisis or coincident with it.

Figure 9 compares housing boom busts with major banking crises. From Table 4 it can be seen that the coincidence is much lower than is the case with all banking crises. Only 11% of house price busts occur within one year of a banking crisis. Also 11% of house price boom peaks occur one year before or coincident with a crisis.

Figure 10 compares stock market boom busts with major banking crises. Only 3% of stock market boom peaks occur within one year of a banking crisis. Also 3% of stock market peaks occur one year before or coincident with a crisis. These findings are similar to those of many studies (e.g. Reinhart and Rogoff 2009) which show housing busts tend to be more associated with major financial crises than stock market boom busts.

Finally I compare asset price boom busts with credit booms. Figure 11 compares house price boom busts with credit boom peaks . I do it for both the loan data and total credit. For loans 6.3% of credit booms occur within one year of a housing price boom bust. For total credit it is 7.2%. I find that no credit boom peaks occur one year before or coincident to a housing bust for loans. For total credit it is 1.4%.

Figure 12 shows the connection between credit booms and stock price busts. Using the loan data I find that 8.5% of credit booms occur within one year of a stock market crash . For total credit it is 10.5%. 6.3% of credit booms occur within one year before or coincident with a stock market crash using the loans measure while 7.2% occur using total credit.

In sum the results comparing credit booms with asset price booms suggest that credit booms only have a very limited connection with asset price busts.

My evidence suggests that the coincidence between credit boom peaks and serious financial crises is quite rare . It also suggests that credit booms are not very closely connected to asset price booms.²²

Indeed a look at when most of the coincidence occurs as is discussed in Appendix I was in two episodes (which some refer to as perfect storms with multiple causes): the Great Contraction 1929-33 and the GFC. This leads to the question whether such rare events should lead to a sea change in monetary policy and financial stability policy. After the Great Contraction the world's monetary authorities believed that it should , and repressed both the domestic and international financial system for 40 years. That strategy led to unintended consequences driven by the dynamics of financial innovation and may in turn have set the seeds for the GFC 80 years later.²³

The current obsession with financial stability (and the increased use of the tools of macro prudential policy and LAW) raises the risk of repeating the mistakes of the 1930s and creating a new regime of financial repression which will most likely have unintended consequences ²⁴. It will

²² These results have some resonance to a recent article by Goetzmann (2015) who shows that equity booms followed by big crashes are quite rare.

²³ Gordon (2014) argues that the Glass Steagall (1933) separation of commercial from investment banking may have been a foundation for the 2007-2008 financial crisis because it led to the rise of market based credit intermediation--firms that engaged in liquidity and maturity transformation without the safeguards of prudential regulation, deposit insurance and LLR facilities. Gordon (2017) following on Calomiris and White 1994) sees deposit insurance, established in the US as a crisis preventer becoming a crisis enhancer. Regulation Q established in 1933 also had unintended consequences in the 1970s and 1980s and was part of the mechanism that led to increasing financial instability after the quiet period of Financial Repression (Bordo and Haubrich 2010).

²⁴ I do not mean to critique all of the New Deal policies. There is a vast literature on this topic. The Banking Holiday of March 1933 ended the banking panics and leaving the gold standard, devaluing the dollar etc also contributed greatly to the recovery (Romer 1992, Edwards 2018, Jalil and Gisela 2015, Eggertson 2008). There is a contentious debate on the New Deal Policies and what their contribution to the recovery was (Cary Brown 1956, Hausman et al. 2017, Cole and Ohanian 2004). Our point is that the financial repression policies on the financial system had serious negative and long consequences. These included the inefficiencies associated with artificial firewalls, the distortions associated with interest rate ceilings (regulation Q) on the

likely head off a few minor financial crises in the next few decades but much later in the future precipitate an even bigger financial crisis than 2007-2008.

The analogy between policies designed to suppress natural disasters should be kept in mind. Scholes (2009) gives the analogy of when “ fire fighters put out every small fire in Yellowstone National Park...The underbrush grew , setting the stage for multiple lightning strikes to cause fires to destroy much greater areas in the park than if fires initially had been left to burn of their own accord.” (page 105). He further argues that “ [f] inancial regulators do the same thing when they dampen volatility: they put out small fires but encourage risk-taking and thus increase the likelihood of a major conflagration” ²⁵ Kim et al (2017) apply this analogy to attempts to smooth recessions which they show are not serially correlated events. They argue from physics that eventually power law dynamics will set in leading to a much worse depression.

6. Lessons from History

My survey of the record of the link between monetary regimes and financial stability in advanced countries in the past two centuries shows a varying evolution between monetary stability and financial stability. It involved a slow learning process by the advanced countries central banks.

Under the gold standard regime monetary stability meant that central banks followed the gold standard convertibility rule and financial stability meant that if adherence was credible central banks could act as lenders of last resort following Bagehot’s strictures to allay financial crises. Financial crises occurred for many reasons including, but not solely, productivity or demography driven asset price booms. The outcome for the real economy depended on the policy actions taken

transmission mechanism of monetary policy, rent seeking behavior by the protected industries etc. See White 2000.

²⁵ See Ip (2015).

and the institutional structure in place. Also, the fixed exchange rate gold standard combined with free capital mobility meant that a number of financial crises became global crises. It also meant that many crises were twin banking and currency crises which had high output costs.

In the interwar gold exchange standard regime monetary policy evolved into providing both real macro stability and price stability along with convertibility. This created a strain on central bank credibility and weakened the power to manage financial crises. In addition during this regime the tight constraint between the monetary gold base and the money supply and bank credit weakened which meant that more monetary fuel could be added to putative asset price booms. The decline in credibility and the pursuit of the flawed real bills doctrine by the Federal Reserve in the 1920s led to a series of policy mistakes that created the Great Contraction — trying to kill the largely productivity driven Wall Street stock market boom leading to a steep downturn in the real economy in the summer of 1929; and then the failure to allay a series of banking panics from 1930 to 1933.

The US shocks were transmitted to the rest of the world by the gold standard fixed exchange rate links and there were serious banking panics in many countries-- most notably Austria and Germany (Bernanke and James 1991). Other countries, especially France, contributed to the collapse by its pro gold sterilization policies. In addition the interwar gold exchange standard had the fatal flaws of maladjustment, illiquidity and lack of confidence which led to its early demise and also helped make the Great Depression a global event.

The Bretton Woods system designed to overcome the flaws of the interwar system was based on capital controls which gave central banks the power to manage the business cycle. It also was accompanied by a regime of domestic financial repression (from the 1930s to the 1970s) established in every country in reaction to the perception that the banks, central banks and financial sector caused the Great Contraction. The financial controls in every country succeeded in

providing financial stability. There were no banking crises in this era in advanced countries. This period was also characterized by exemplary macroeconomic performance.²⁶

However, the Bretton Woods system itself suffered from the same fatal flaws in adjustment, liquidity and confidence as in the interwar gold exchange standard. In addition the Bretton Woods system evolved into a gold dollar standard with the US dollar as the anchor currency of the system. Until 1965 the US credibly followed the key rule of the regime to maintain price stability and convertibility of the dollar into gold at the fixed parity of \$35.000 per ounce. However beginning in 1965, under pressure by the administration to accommodate the strong fiscal pressures of the Vietnam war and LBJ's Great Society, the Fed broke the rule for a key currency country and began the inflationary process that became the Great Inflation. This doomed the system to collapse by 1971 when President Nixon closed the gold window. The capital controls and financial controls of that era also led to financial innovation (e.g. Eurodollars) devised to evade them further undermining the system.

The subsequent fiat managed floating exchange rate system without the nominal anchor of gold deteriorated into high inflation as most countries (with the exception of Germany and Switzerland) used expansionary monetary policy to reduce unemployment at the expense of inflation. During this period both capital controls and domestic financial controls ended. The domestic controls were

²⁶ It may be argued that since the decades of the 1950s and 1960s were ones of rapid and stable real growth and low and stable inflation, that the financial repression regime was responsible for this good state of affairs.

But one could also argue that that much of the rapid real growth of that period (especially in Europe and Japan) reflected the recovery from the devastation of World War II as well as a grand bargain between capital and labor (Eichengreen 1995).

An extensive literature on the inefficiencies and rent seeking in the financial system (Bordo and Sylla 1995, White 2000) suggests that had the repression been absent that real growth may have been faster and may not have collapsed as it did in the 1970s.

undermined by the run up in inflation. As a consequence, the financial crisis problem reappeared in the 1970s.

The Volcker shock of 1979 restored price stability (at the expense of a serious recession) and led to a 20-year period of low inflation and rapid and stable economic growth referred to as the Great Moderation. Many argue that it was anchored by credibility for low inflation and the pursuit of non-discretionary rule-like monetary policy (the Taylor Rule)²⁷.

In the post war the Federal Reserve and other central banks learned the lessons of the 1930s to act as lenders of last resort. However, they began to stray from following Bagehot's strictures and bailing out insolvent banks deemed to be "too big to fail." In addition, deposit insurance and the financial sector safety net created guarantees of the financial system which converted banking panics into fiscally resolved financial crises which became increasingly more expensive to resolve.

In this era of financial globalization along with domestic financial liberalization, credit driven asset price booms reappeared in several European countries and Japan in the 1980s²⁸. They were exacerbated by loose discretionary monetary policy in an environment of financial innovation.

A key lesson from the historical record through the Great Moderation period is that if four key principles are followed a stable monetary policy regime can be compatible with financial stability: a) price stability (credibility for low inflation); b) real macro stability (via e.g flexible inflation targeting); a credible rules based lender of last resort, and d) sound financial supervision and regulation and banking structure.

²⁷ See Taylor (2006), Molodtsova and Pappell (2013), Clarida (2012) and Levin (2014).

²⁸ The IMF uses this experience to make the case for capital controls. The lessons from this paper suggest that sound macro policies in each country with sound regulation may be a better solution. It would prevent crises from happening in the first place and also limit the degree of contagion when they happen. Canada which has followed this approach has never had a financial crisis with or without capital controls.

Indeed one country that has avoided banking crises altogether is Canada which pretty closely followed these principles.²⁹ A key difference between Canada and its southern neighbor has been sound bank structure and prudent financial regulation (Bordo, Redish and Rockoff 2015). The Canadian experience may offer lessons to other countries.

The Global Financial Crisis of 2007-2008 began with the Subprime Mortgage crisis. It was caused by US housing policy, aggravated by loose monetary policy in a departure from the rule like behavior of the Great Moderation. Other forces were: the failure of the financial regulatory and supervisory authorities to contain the growth of credit derivatives, leverage and the shadow banking system ,and global imbalances.

The Global Financial Crisis and the Great Recession were contained by effective monetary and fiscal policies and an unorthodox extension of the lender of last resort by the Fed and other authorities who had learned the lessons of the 1930s. However, like the 1930s, the GFC was blamed on the banks and the financial system and this has led to the creation of a new regime of financial regulation and the elevation of the financial stability mandate to primary importance.

The current case for elevation of the financial stability mandate to paramount importance and encouraging central banks to use their monetary policy tools (LAW policy) as well as new tools of macro prudential policy to head off imbalances and especially credit driven asset price booms is based on the assumption that serious financial crises are largely caused by credit driven asset price booms and the failure of the monetary (and regulatory) authorities to head them off .

My empirical evidence casts doubt on this assumption. Financial crises are very heterogeneous. Moreover, the record suggests that these events are very rare. Indeed the recent GFC may have

²⁹ With the principal exception of the Great Inflation where Canada performed about as badly as most advanced countries.

been a one off event, a perfect storm (with multiple causes) possibly like the Great Contraction of 1929 to 1933.

This raises the question whether such rare events should lead to a sea change in monetary policy and financial stability policy as occurred after the Great Contraction. That strategy created an environment of financial repression which did provide financial stability but which also set in place forces which led to unforeseen and eventually serious threats to financial stability and may have sown the seeds for the GFC 80 years later.

The current obsession with financial stability risks recreating some of the policies of the 1930s, 40s ,50s and 60s. In addition to financial repression, the adoption of many of the tools of macro prudential regulation that have been proposed may recreate many of the problems with the use of the tools in the past³⁰. Many of these macro prudential policies were actually credit or fiscal policies which greatly involved the monetary authorities in inefficiently picking winners and losers and influencing the allocation of resources .³¹ They also impinged on central bank independence because these policies strayed from their mandates and opened them up to scrutiny and criticism by the legislature.³² (Goodfriend 2014), The pursuit of such an enhanced financial stability strategy may head off a few minor crises in the next few decades but much later precipitate an even bigger crisis than we saw a decade ago.

My survey of the historical record on the connection between the monetary regime and financial stability teaches us that a knowledge of history matters. Basing important regime changing

³⁰ One of the tools of macro prudential policy—raising capital requirements – many argue may be the most effective and simple way to improve financial stability (See Admati and Hellweg (2013), Calomiris 2017)

³¹ I also am not suggesting that there is not a strong role for micro prudential regulation policy.

³² This suggests that to the extent these tools are used at all, that they should be implemented by an agency other than the central bank (but in full cooperation with the central bank) (see Svensson 2015 and Bordo 2017).

decisions on the record of the last crisis ignores the heterogeneity of the crisis problem. History teaches us the importance of relearning the details of the events of the past which often contain important and long forgotten clues to aid in our understanding of the 'crise du jour'.

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Tables and Figures

Table 1: Countries involved in Global Crises.

Period	Countries Involved
1890-1891	Argentina, Brazil, Chile, Germany, Italy, New Zealand, Paraguay, Portugal, South Africa, UK, USA
1907-1908	Chile, Denmark, Egypt, France, Italy, Japan, Mexico, Sweden, USA
1913-1914	Argentina, Belgium, Brazil, France, India, Italy, Japan, Mexico, Netherlands, Norway, UK, Uruguay, USA
1931-1932	Argentina, Austria, Belgium, Brazil, China, Denmark, Finland, France, Germany, Greece, Italy, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, USA
2007-2008	Austria, Belgium, Denmark, France, Germany, Greece, Ireland, Netherlands, Portugal, Russia, Spain, Sweden, Switzerland, UK, USA.

Source: Bordo and Landon-Lane (2010)

Table 2: Major Banking Crises 1825-2008

Crisis year	Country	Serious (%ΔGDP)	Output loss (%)	Currency crisis	Global crisis	ER Regime	Credit boom	CB in place	LLR	Crisis year	Country	Fiscal resolution	Banking structure
1825	UK	Yes (na)	NA	Yes	Yes	Gold	Yes (Latin America)	Yes	Ineffective	1825	UK	Treasury letter	Unit
1847	UK	Yes (-2.53)	NA	No	No	Gold	Yes (Railroad)	Yes	Ineffective	1847	UK	Treasury letter	Unit
1866	UK	Yes (-1.25)	NA	No	No	Gold	No	Yes	Ineffective	1866	UK	Treasury letter	Branch
1890	UK	No (-4.94)	8.91	No	Yes	Gold	Yes (Argentina)	Yes	Effective	1890	UK	Treasury backstop	Branch
1893	Australia	Yes (-20.5)	90.65	No	Maybe	Gold	Yes (Land)	No	No	1893	Australia	Yes	Branch
1873	US	Yes (-19.33)	NA	No	Yes	Greenback (paper)	Yes (Railroad)	No	No*	1873	US	No	Unit
1893	US	Yes (-11.11)	8.65	Yes	Maybe	Gold	No	No	No*	1893	US	No	Unit
1907	US	Yes (-10.21)	55.65	No	Yes	Gold	No	No	No*	1907	US	No	Unit
1929	US	Yes (-30.76)	101	Yes	Yes	Gold	Yes (Wall Street)	Yes	No	1929	US	No**	Unit
1990-1992	Nordics†	Yes (-3.9)	45.65‡	Yes	No	Fixed	Yes (Real Estate)	Yes	Effective	1990-1992	Nordics	Yes (bailouts)	Universal
1991	Japan	Yes (-0.025)	18.3	No	No	Floating	Yes (Real Estate)	Yes	Ineffective	1991	Japan	Yes (bailouts)	Universal
2007	US	Yes (-5.71)	26.2	No	Yes	Floating	Yes (Real Estate)	Yes	Effective	2007	US	Yes (bailouts)	Universal

Notes: † Finland, Norway and Sweden; ‡ Finland and Sweden; * Clearing houses; ** Reconstruction Finance Corporation.

Sources: Bordo (2003); Bordo and Landon-Lane (2012); Bordo and Meissner (2016)

Table 3: Frequency of Credit Booms and Banking Crises

Variable	Number of Banking Crises	Number of Credit Booms	Number of Credit Boom Peaks within 1 year of Banking Crisis	Number of Credit Boom Peaks 1 year before or on a Banking Crisis
Loans	69	53	12	4
Loans + Domestic credit	69	75	12	5
Loans (major banking crises)	29	53	7	2
Loans + Domestic credit (major banking crises)	29	75	7	2

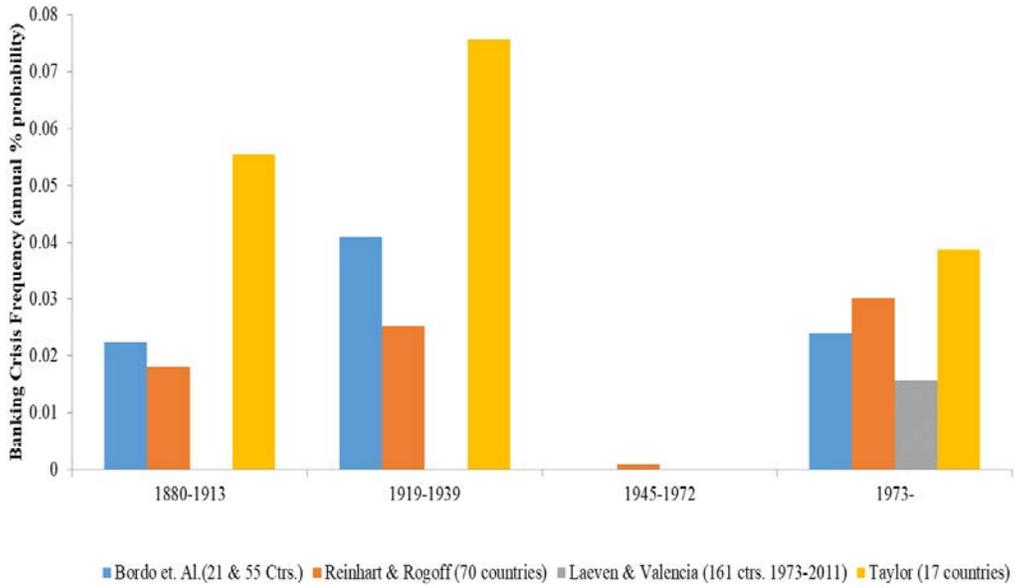
Table 4: Frequency of Major Banking Crises and Asset Price Booms/Busts

Variable	Number of Major Banking Crises	Number of Asset Price Booms	Number of Asset Boom Peaks within 1 year of Banking Crisis	Number of Credit Boom Peaks 1 year before or on a Banking Crisis
House prices	25	27	3	3
Stock prices	25	101	3	3

Table 5: Frequency of Credit Booms and Asset Price Booms/Busts

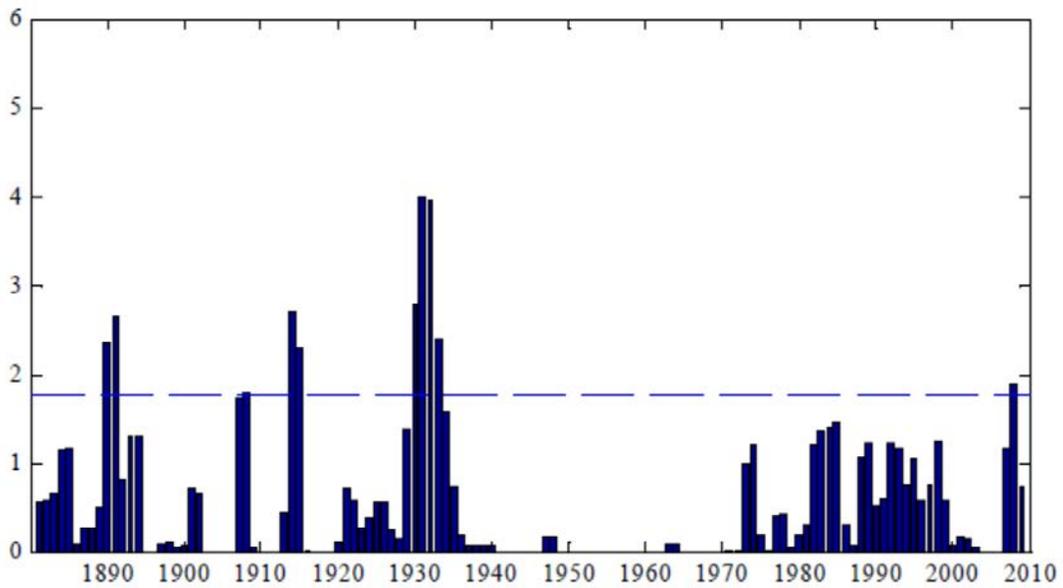
Variable	Number of Asset Price Booms	Number of Credit Booms	Number of Credit Boom Peaks within 1 year of Asset Price Bust	Number of Credit Boom Peaks 1 year before or on an Asset Price Bust
House prices (loans)	27	47	3	0
House prices (Domestic Credit –Gorton data)	27	69	5	1
Stock prices (loans)	101	47	4	3
Stock prices (Domestic Credit – Gorton data)	101	69	7	5

Figure 1: Frequency of Banking Crises with different databases



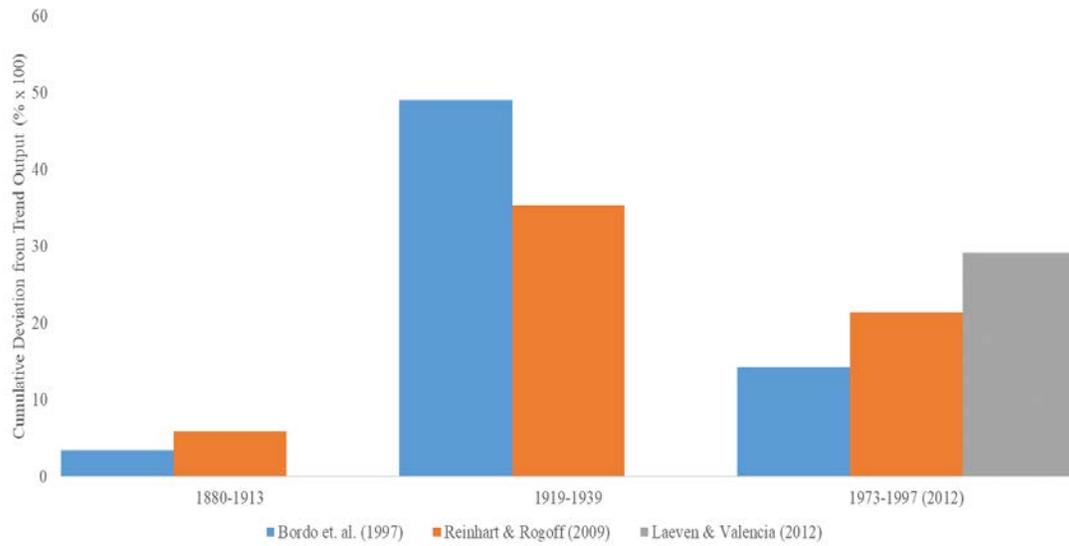
Source: Bordo and Meissner (2016)

Figure 2: Weighted Two-Period Moving Sum of Banking Crises 1880-2009



Source: Bordo and Landon-Lane (2010)

Figure 3: Output Losses



Source: Bordo and Meissner (2016)

Figure 4: Banking Crises and Credit Booms (Loans)

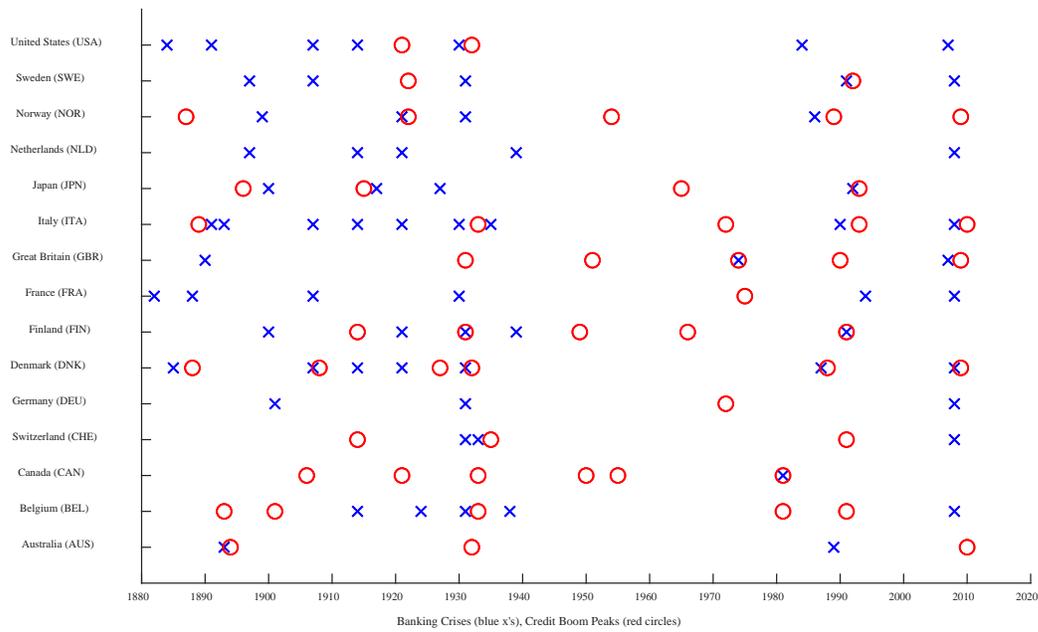


Figure 5: Banking Crises and Credit Booms (Loans and Credit)

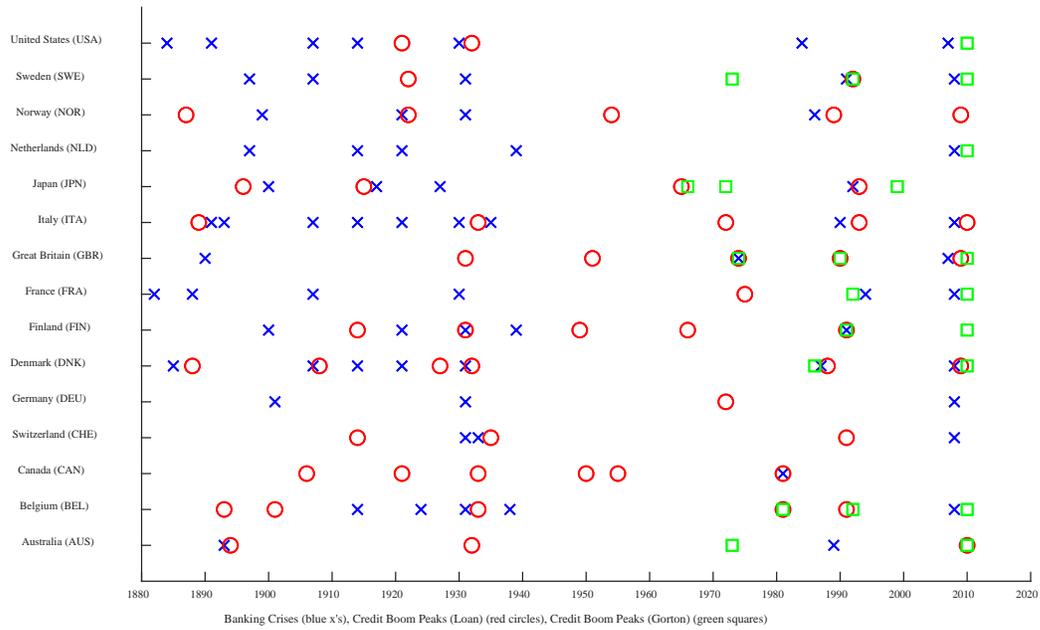


Figure 6: Major Banking Crises and Credit Booms (Loans and Credit)

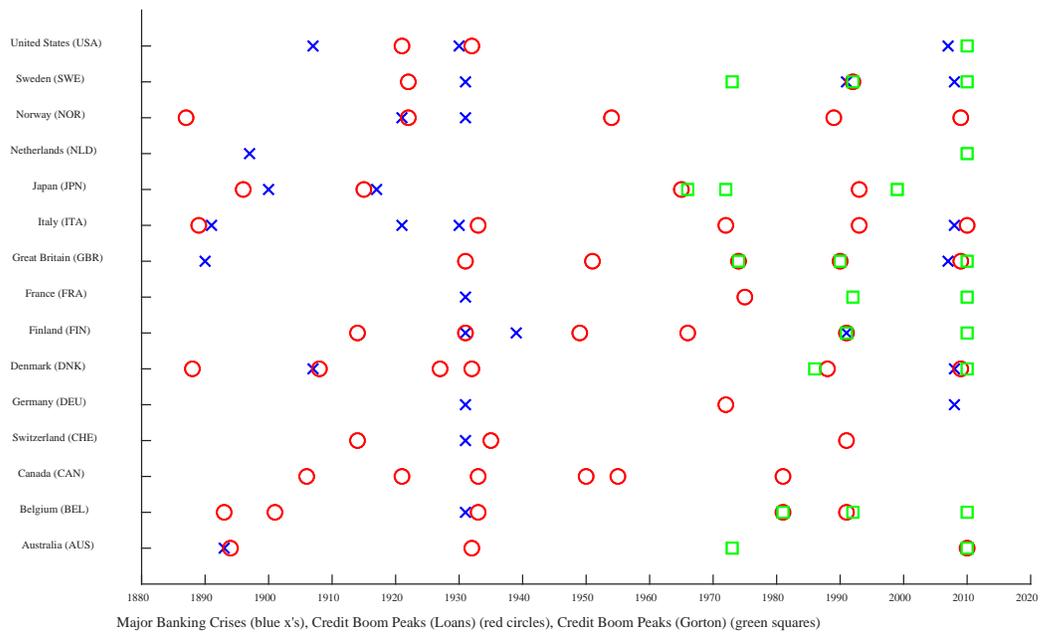


Figure 7: Banking Crises and House Price Booms

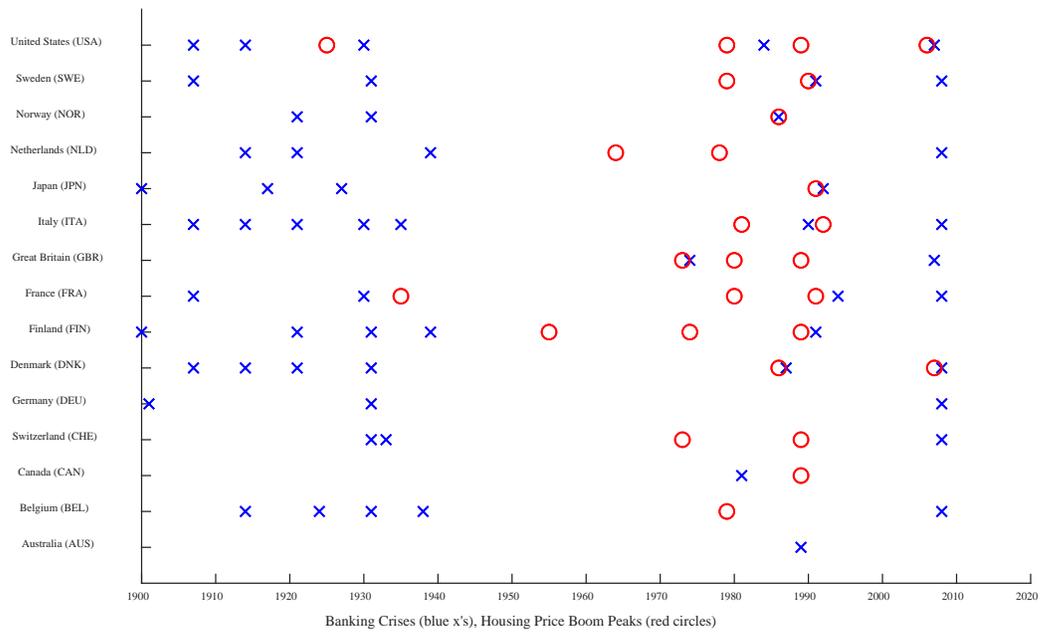


Figure 8: Banking Crises and Stock Price Booms

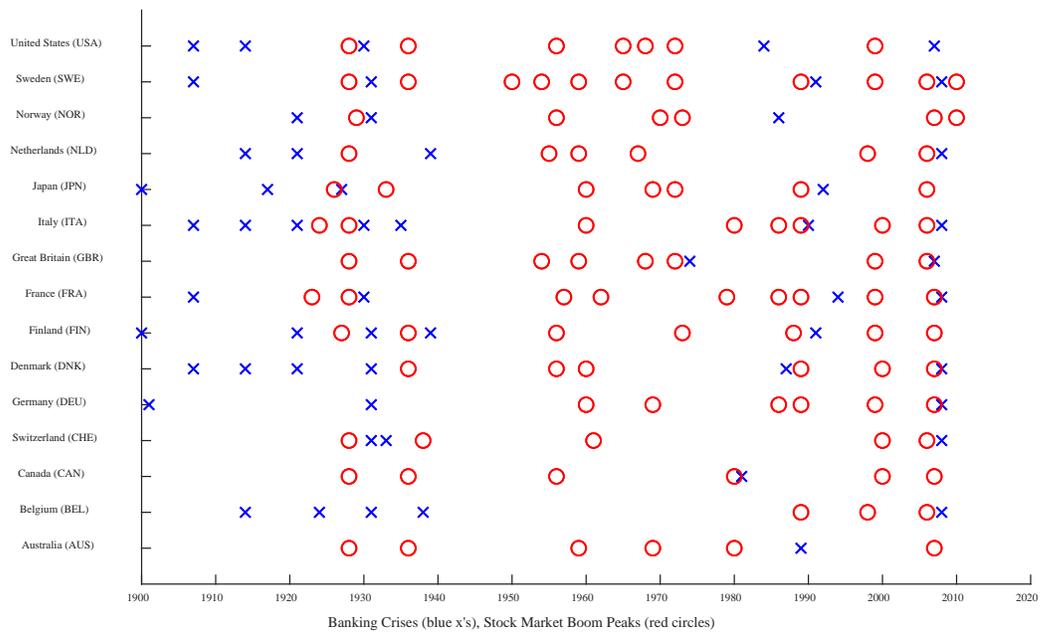


Figure 9: Major Banking Crises and House Price Booms

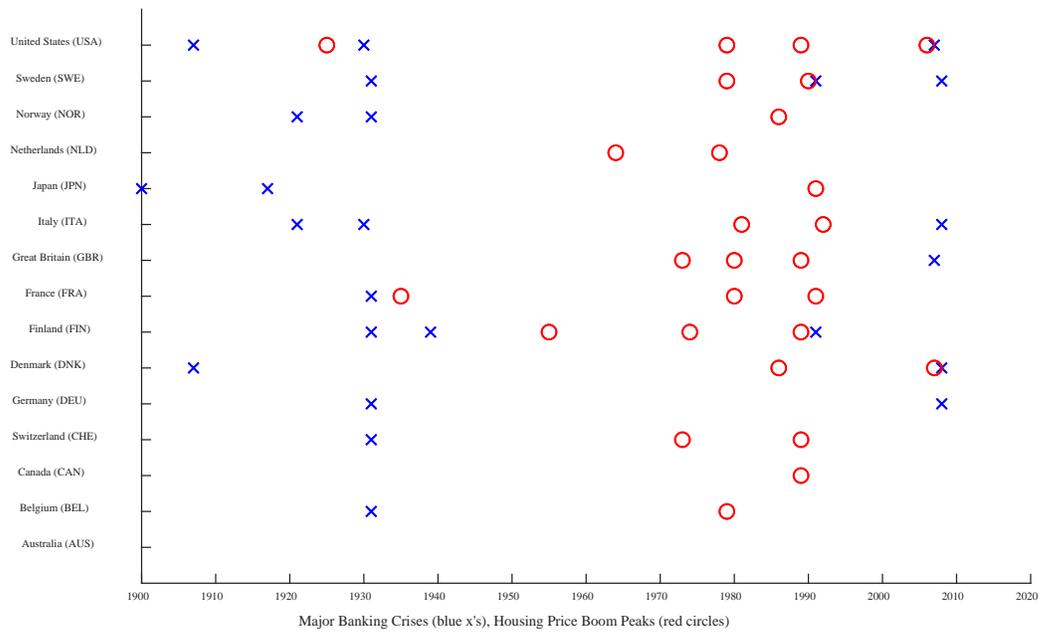


Figure 10: Major Banking Crises and Stock Price Booms

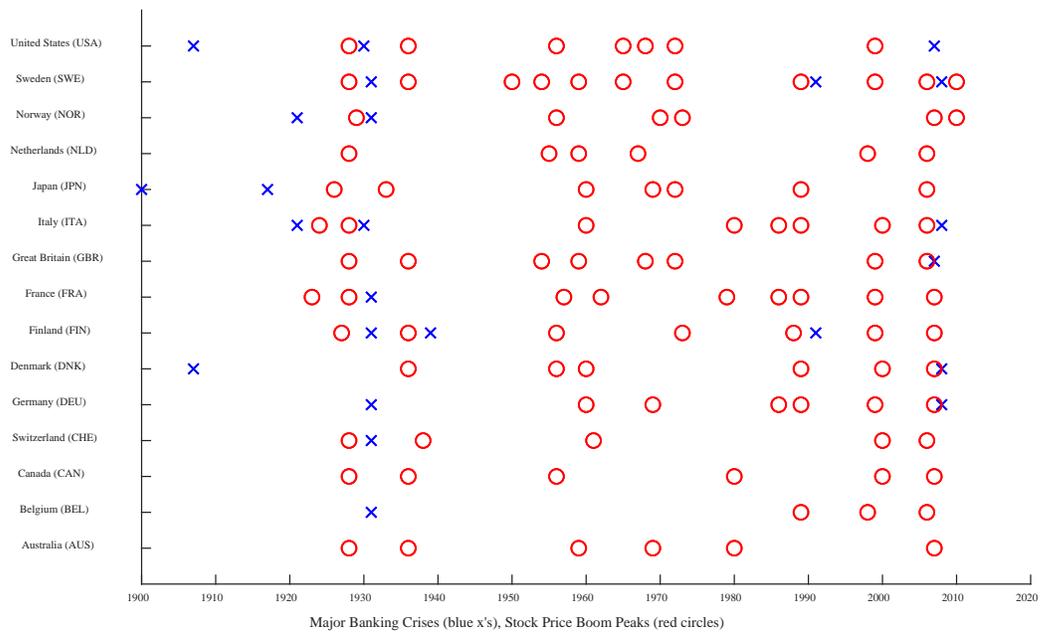


Figure 11: House Price Booms and Credit Booms (Loans and Credit)

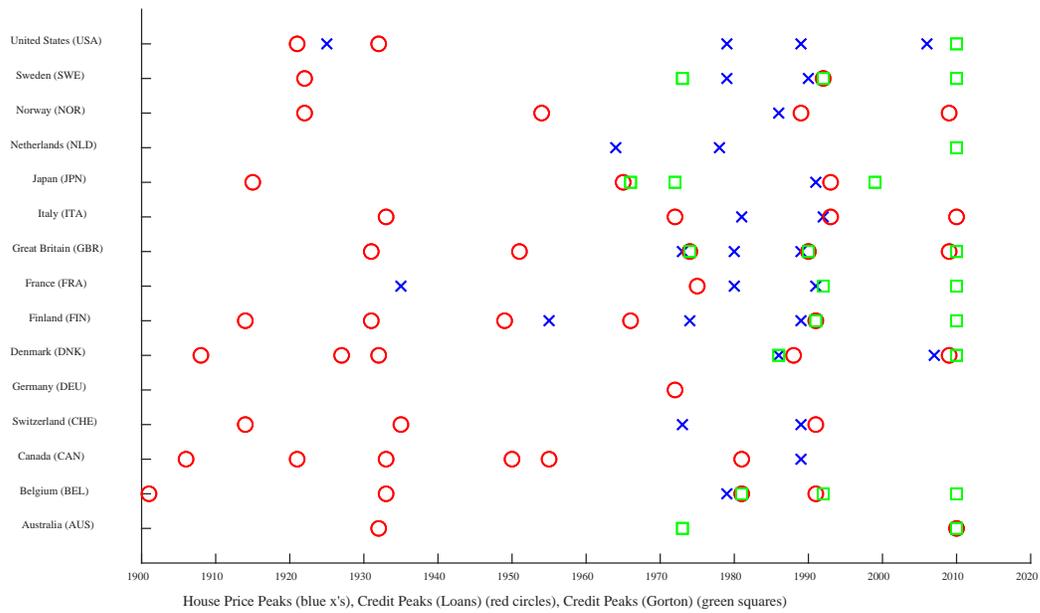
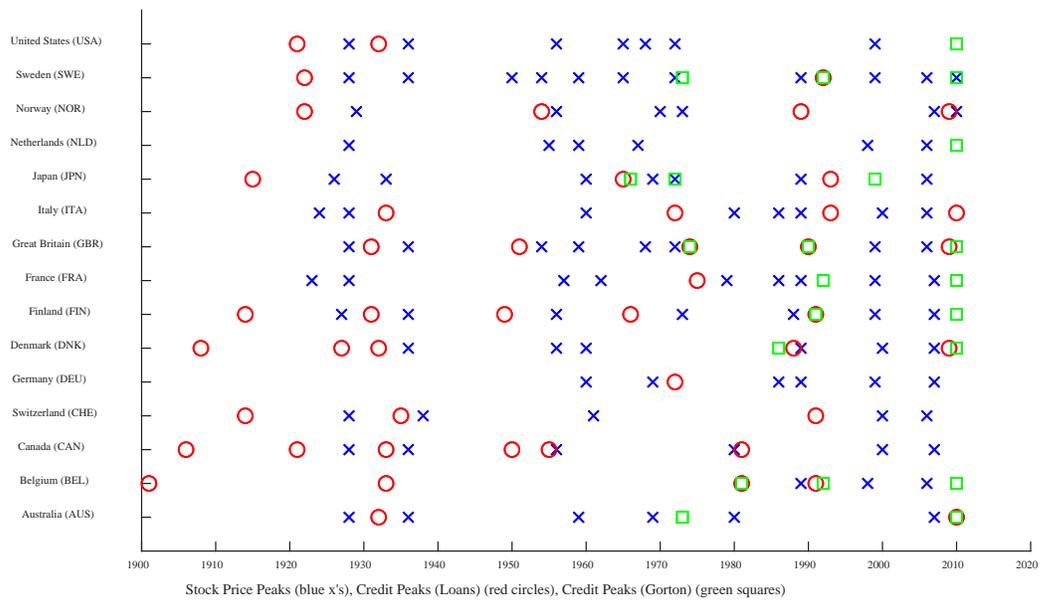


Figure 12: Stock Price Booms and Credit Booms (Loans and Credit)



Appendix I. Twelve Banking Crises Narratives

A.1 The UK 1825 to 1890

1825. The first global financial crisis occurred in London in 1825. It involved many of the elements of a classic crisis—a stock market boom bust , a banking panic , a sudden stop of capital flows to Latin America and a series of debt defaults there (Bordo 1998, Neal 1998 Brunnermeier and Schnabel 2016). After the Napoleonic wars and the successful resumption of the gold standard in 1821, the British economy enjoyed a period of rapid expansion, stimulated by an export boom to the newly independent states of Latin America and investment in infra structure projects (e.g. gas lighting, canals and railroads). The sale of stocks to finance those ventures, in addition to gold and silver mines (some real and fictitious) in Latin America propelled a stock market boom and expansion of country bank notes. Prices rose by 78% in the boom. Indications are that the April 1825 collapse in stock prices was related to the prior tightening of the Bank of England’s monetary policy stance in response to a decline in its gold reserves. The collapse, in which stock prices fell by 34% triggered bank failures, which, once they reached important City of London banks precipitated a full-fledged panic in early December. Only then did the Bank of England begin to act as a lender of last resort but it was too late to prevent massive bank failures, contraction of loans , and a serious recession. Thus the key element of the crisis was a bank credit and equity financed stock market boom and an ineffective lender of last resort to allay the resulting banking panic.

1847. the 1840s railroad mania in the UK was a precedent for the dot.com boom(Bordo 2003). After the first successful railroad was established in 1830, optimistic expectations about potential profits that later turned out to be over optimistic led to massive investment in rails and rolling

stock financed by bank credit, acceptances , foreign investment and domestic savings (Brunnermeier and Schnabel 2016) which extended the network across the country. The boom was accommodated by expansionary monetary policy in response to gold inflows. The end of the railroad boom was associated with the banking panic of 1847—one of the worst in British history. The crash , in which stock prices fell by 30% and the panic, as in earlier episodes , may have been triggered by tightening of the Bank of England’s policy stance , reflecting its concern over declining gold reserves in the face of a harvest failure. The panic led to many bank failures and a serious recession. The panic like 1825 had elements of a credit driven asset price boom combined with a failure by the Bank of England to be a lender of last resort.

1866. The Overend Gurney Crisis

The Overend Gurney Crisis in 1866 was the last banking panic in the UK (before Northern Rock in 2007). According to Schwartz(1986) it was the last time that the Bank of England failed to act as a lender of last resort.

Overend Gurney was a discount house which had taken on risky investments in the 1860s. It was the largest discount house and according to Batchelor (1986) , the Directors of the Bank of England viewed it as a rival so that when it became insolvent in 1866 the Bank refused to rescue it. Its failure then led to the failure of a number of country banks associated with it and the English Joint Stock bank. This was followed by a run on London banks and finance houses by the country banks . This in turn led to a classic banking panic as the public tried to convert their deposits into Bank of England notes. The run spread to the Bank of England itself. The Bank hesitated in requesting a Treasury Letter releasing it from the convertibility constraint of the 1844 Bank Charter act until the Chancellor of the Exchequer suspended the Act. This action ended the panic.

Walter Bagehot (1873) criticized the bank for hesitating in providing liquidity to allay the panic “ To lend a great deal, and yet not give the public confidence that you will lend sufficiently and effectually , is the worst of all policies, but it is the policy now pursued.””

Thus the Overend Gurney panic began with bad business decisions by its directors and became a panic when the Bank of England failed to act as a lender of last resort.

1890 the Baring Crisis

The 1890 crisis in London also resulted from unwise investment decisions by its directors investing in securities financing a land boom in Argentina which turned to bust in the face of financial instability. Like Overend Gurney in 1866 when insolvency loomed the Barings directors turned to the Bank of England for a rescue. The Bank complied and arranged what became known as a lifeboat rescue. According to Batchelor (1986) the Bank was willing to rescue the insolvent Barings bank but not Overend Gurney because the Bank’s directors were better connected to Barings directors. The Bank arranged a lifeboat rescue of Barings by a syndicate of banks , led by the Bank of England itself to share in any losses from Barings liquidation. The Bank then split the old firm into a good bank which was recapitalized and a bad bank which held the toxic securities—a technique used a century later by Sweden (White 2016).The syndicate and the bad bank which held the toxic securities in turn was guaranteed from loss by the British Treasury. Announcement of the lifeboat allayed the markets and a panic was avoided. In addition gold loans to the Bank by the Banque de France and the Russian Government (central bank cooperation) also helped backstop the Bank of England (Bordo and Schenk 2016) According to Hautcoeur, Riva and White (2014) the model for the lifeboat came from a rescue the year before of a major financial institution , the Comptoir d’Escompte by the Banque de France. Unlike the other events that we discuss, this is one of the few potentially serious crises which was avoided by wise lender of last resort actions.

A.2 Australia 1893

Australia experienced a massive land boom in the 1870s and 1880s in the face of rapid immigration and British demand for wool. Capital flows from London channeled through the trading banks financed the building of cities and the extension of pastoral land. The trading banks funded the non-bank intermediaries (pastoral companies) that financed mortgages, so that de facto they violated the real bills doctrine that governed colonial banking and they were exposed to a maturity mismatch. While real estate lending had long been banned or discouraged the colony of Victoria removed this restriction in 1888 (Bordo and Meissner 2015).

The trading companies (Australian banks with offices in London) actively solicited deposits in England and Scotland, offering a higher rate of interest than the British domestic banks. In a sense they fooled the British (mainly Scottish) savers into believing that the Australian banks were similar to Scottish banks.

The “Law of Gravity” kicked in in the late 1880s when the terms of trade turned against Australian wool. The commodity boom of the 1880s (which was worldwide) led to the failures of many pastoral companies and mortgage companies in 1891-92.

The crisis spread to the trading banks in 1892-93 (the Mercantile Bank of Australia, the Federal bank of Australia and the Commercial Bank of Australia) leading to a full-fledged banking panic. Although the Associated Banks were supposed to pool the assets of the Melbourne banks to save banks from liquidity problems, they failed to do so for the Federal Bank. The government of Victoria tried to collaborate with the Associated Banks in Melbourne to save the Commercial bank. While the forum reiterated its intentions, the Commercial Bank was soon allowed to fail. In New South Wales, bank notes were given legal tender status to ease access to means of payment, and the government declared a 5 day banking holiday (Bordo and Eichengreen 1999). Depositors were

forced to exchange their demand and savings deposits for long-term deposits and debentures and hence lost liquidity.

British depositors also were caught by the crisis and pulled their funds from the Australian banks. In consequence, Australia was hit by a classic sudden stop of international capital and Australia suffered a serious depression for much of the 1890s. This was aggravated by a serious drought.

In reaction to the crisis, unlike what happened in the US and Canada, the banks were not regulated by the government. The surviving banks retrenched heavily; raised their capital and liquidity ratios and gave up mortgage lending. The colonial governments set up their own mortgage banks and thereby funded agricultural expansion and urban lending.

A.3 United States

The United States had the largest number of banking crises compared to any other advanced country. Much of the sorry record can be explained by the political economy of the federal system that came out of the Constitution of 1787. The Constitution gave control over the currency to Congress but not control over banking. Consequently the U.S. banking system was based on State chartered unit banks with often only one office. Two attempts to establish a central bank—the First and Second Banks of the United States—had their charters torpedoed after 20 years by the forces of populism and States rights.

In the pre-civil war period several banking panics occurred often brought about by a combination of speculation in infrastructure stocks, malfeasance, political shocks and sudden stops in capital flows from England (1792, 1817, 1837, 1839, 1857, 1861) in an environment without a lender of last resort. Frequent bank failures as well as panics created an unstable and inefficient payments system.

During the Civil War, the National Banking System was established to provide a safe and uniform currency—national bank notes—to be issued by Federal government chartered national banks. The national banking system was successful in creating a uniform and safe currency but it was still hit by a series of major banking crises. The continued high incidence of banking panics reflected two major flaws in the system: the inverted pyramid of credit which led to a connection between stock market crashes and banking panics; and the absence of a lender of last resort. The private sector substitute of clearing house loan certificates did succeed in preventing two minor crises (1884 and 1890) but did not prevent major panics in 1873, 1893 and 1907. The big panics of the national banking era were not largely driven by credit fueled asset price booms with the possible exception of 1873.

1873. One of the classic lending boom busts leading to a banking panic was the railroad boom in the 1870s which opened up the American west. The post –civil war era experienced one of the most rapid growth rates in U.S. history. Much of the financing of railroad investment came from British capital inflows which in turn accompanied by gold inflows permitted monetary expansion. The boom was also accompanied by corporate malfeasance and corruption (Benmelech and Bordo 2008). The boom ended with a sudden stop of foreign capital and a stock market crash followed by a banking panic and a recession which only ended in 1879. The panic was allayed by a suspension of convertibility of deposits into currency after an unsuccessful rescue by the New York Clearing house.

1893. The 1890s were characterized by deflation and sluggish growth. Two key phenomenon behind the slowdown was a decline in world gold prices to which the U.S. had to adjust and the peak of the soft money silver agitation. Fears by foreign and domestic investors that the issue of silver certificates under the Sherman Silver Purchase Act of 1890 would force the U.S. off the gold

standard led to heavy capital outflows (Friedman and Schwartz 1963). This produced a drain on the Treasury's gold reserves and a drain on the reserves of the money center banks in the east. At the same time the deflation was reducing the value of bank assets. A stock market crash starting in May 1893 led to a surge of bank runs as the public (mainly in the interior) sought to convert their deposits into currency. The external drain was aggravated by an internal drain. Western banks tried to draw down their reserves from their correspondents in New York City,.

The Panic of 1893 was characterized by two waves of bank runs and failures in May-June and in July. The latter involved runs on the New York banks. J.P. Morgan and the New York Clearing House attempted to end the panic in New York by the issue of clearing house loan certificates., but it was not successful (Gorton and Tallman 2016). The panic ended with a suspension of specie payments by the banks in July which lasted until September. (Friedman and Schwartz 1963). Thus the panic was driven by political uncertainty and the absence of a lender of last resort.

1907. The 1907-08 banking panic is considered the most important financial crisis in the U.S. before the Great Depression. It led to the successful movement towards monetary reform that created the Federal Reserve System (Bordo and Wheelock 2011).

Gold had been flowing into the U.S. preceding 1906 . The San Francisco earthquake of 1906 led to major remittances to the U.S. by British insurance companies. The Bank of England became alarmed by the capital flows to the U.S. and gold drains from its reserves. Consequently it raised its Bank rate and also rationed credit to the merchant banks engaged in US trade finance. In a sense it was a sudden stop (Odell and Wiedenmeier 2004) . In the fall of 1906 European investors reduced their holdings of U.S. securities leading to a large gold outflow. This disinvestment was associated with a sharp drop in U.S. stock prices March to August 1907 and a recession beginning in May. The crisis began on October 14, when 5 banks that were members of the New York

Clearinghouse and 3 others requested assistance from other clearing house banks. “ These 8 banks were controlled through stock ownership on margin by a few men of no great financial stability , who used the banks to further speculation in the stock of copper mining companies” (Schwartz 1986) . A decline in the price of these stocks alarmed depositors who started runs. Order was restored by the requests being granted.

However on October 21 , a run was started on Knickerbocker Trust Company , the third largest trust company in New York, because its President had had dealings with one of the affected banks. It was not aided because it was not a member of the Clearing House. It suspended payments the next day, whereupon a run started on the second largest Trust company on October 23 and another big trust company the next day.

The New York Clearing House granted assistance to the trust companies but not fast enough to avoid precipitating a general alarm outside New York City . Pressure on the New York banks reserves from other cities was initially allayed by the Treasury depositing \$25 million in key New York banks on October 24 as well as by a pool of funds extended to the banks by a syndicate headed by JP Morgan. The New York Clearing House began issuing loan certificates on October 26 but faced with increasing demands from interior banks on their reserves, The New York banks restricted convertibility of their deposits into currency, quickly followed by the rest of the country which ended the panic. Like 1893 the 1907 crisis resulted from a sudden stop in an environment without an effective lender of last resort.

1929-33. World War I greatly disrupted the global order and its aftermath was associated with considerable financial instability. Disinflation and deflation led to banking crises in many

European economies in 1920-21.³³ Most of the European crises were dealt with by fiscal rescues.(Feinstein, Temin and Toniolo 1997).

The main event of the 1920s was the Wall Street stock market boom from 1926 to 1929 and the crash in October 1929. Many other countries had booming stock markets in this period . The U.S. experienced a housing boom from 1922 to 1925 but it did not lead to a serious bust or a financial crisis (White 2014). Eichengreen and Mitchener (2004) following the BIS approach argue that the Great Depression could be viewed as a credit boom gone wrong i.e. as a credit boom accommodated by expansionary monetary policy. They present evidence for their interpretation based on their measurement of a credit boom (deviations from trend of the ratio of broad money to GDP, the investment ratio, and real stock prices) for a panel of 9 countries.

During the boom stock prices rose by over 200%, the collapse from 1929 to 1932 had prices decline by 66%. The boom was associated with massive investment that brought the major inventions of the late nineteenth century, eg electricity and the automobile, to fruition. In addition, major innovations also profoundly changed industrial organization and the financial sector, including the increased use of equity as a financial instrument. The economy of the 1920s (following the sharp recession of 1920-21) was characterized by rapid real growth, rapid productivity advance and slightly declining prices, punctuated by two minor recessions. Irving Fisher and other contemporaries believed that the stock market boom reflected the fundamentals of future profits from the high growth industries that were coming on stream and that it was not a bubble.

³³ The U.S. did not have a banking panic in 1920, as had occurred in the National Banking Era. Gorton and Metrick(2013) argue that this was because the Federal reserve was in place to provide liquidity to the New York money market. Also see Tallman and White(2017) who argue that several of the Reserve banks followed LLR policies.

McGrattan and Prescott (2003) concurs with this view although many others regard it as a bubble (Galbraith 1955, White and Rappoport 1993,1994).

Debate continues over the role of expansionary Federal Reserve monetary policy in fueling the boom. In 1932 Adolph Miller , a member of the Federal Reserve Board blamed the New York Fed and its President Benjamin Strong for pursuing expansionary open market purchases to help Great Britain restore the pound to its pre- war parity in 1924 and then again in 1927 to protect sterling from speculative attack. In both cases the U.S. economy was in recession justifying expansionary policy (Friedman and Schwartz 1963). Miller indicted Strong (who died in 1928) for fueling the stock market boom and the resultant crash. His views were instrumental in legislation in 1933 which prohibited Reserve banks from engaging in international monetary policy actions (Bordo, Humpage and Schwartz 2015).

Regardless of the outcome of this debate , the market crashed in October 1929 and the crash is usually blamed on tight Federal Reserve policy. The Fed, following its adherence to the “real bills” doctrine was increasingly concerned over stock market speculation beginning in 1927. After policy was tightened through 1928 and early 1929, a recession began in July 1929. This , according to White (1990) led to a revision of the prevailing optimism and the crash in equities.

The consensus view by economists is that the 1929 crash was not the pivot of the Great Contraction (Friedman and Schwartz 1963 and Romer 1993) but that it had a major effect on the first year of the recession. It reduced output via wealth effects on consumption, reduced investment, and reduced velocity. The consensus view is that the recession became a “ Great Depression” beginning in 1930 after the Fed failed to act as a lender of last resort according to its mandate to prevent a series of (liquidity driven)banking panics which erupted in the next three years (Bordo and Landon-Lane 2010).The banking panics in turn impacted the real economy

through the collapse in money supply, which produced massive deflation(Friedman and Schwartz 1960 and financial disintermediation(Bernanke 1983). The depression spread abroad through the fixed exchange rates of the gold standard.

A.4 Post World War II

As discussed above the reaction to the financial instability in the 1930s led to a regime of financial repression from the mid 1930s to the mid 1970s across the world. With liberalization of both the domestic and international financial systems came financial instability. Two key events in the 1970s were the failure in 1974 of Franklin National bank in the US and Herstatt bank in Germany, both had made risky bets in the foreign exchange market which had expanded greatly after the collapse of the Bretton Woods system. In the US case , Franklin National was bailed out on the grounds that it would prevent contagion to other banks. In Germany , Herstatt was allowed to fail. The failure of Continental Illinois bank in 1984 led to a bail out by the US monetary authorities on the grounds that Continental Illinois, the eighth largest bank in the country was “ too big to fail”. This led to the Fed’s adoption of the Too Big to Fail (TBTF) doctrine and, to head off the risk of moral hazard, the adoption of the strategy of ‘creative ambiguity—that declaring in advance which banks would be deemed large enough to be bailed out.

In other advanced countries in the 1980s, with liberalization of their financial systems and financial globalization a series of major financial crises occurred.

A.5 The Japanese Financial Crisis

Japan experienced a boom bust cycle in the mid 1980s with a run up of real estate prices fueled by an increase in bank lending and easy monetary policy. The Bank of Japan began following a looser monetary policy after the Plaza Accord of 1985, to attempt to devalue the yen and ease upward pressure on the dollar. The property price boom in turn led to a stock market boom as the increased value of property owned by firms raised future profits and hence stock prices (Ito and Iwaisako 1996). Both rising prices and stock prices in turn increased firms collateral encouraging further bank loans and more fuel for the boom. The bust was triggered by the Bank of Japan's pursuit of a tight monetary policy in 1989 to stem the asset market boom.

The subsequent asset price collapse in the next five years led to a collapse in bank lending with a decline in the collateral backing corporate loans. The decline in asset prices further impinged on the banking system's capital, making many banks insolvent. The banking crisis of 1990 occurred because the collapse in asset prices reduced the value of their capital. Lender of last resort policy prevented a classic banking panic but regulatory forbearance propped up insolvent banks. It took over a decade to resolve the banking crisis and Japan is only now resuming moderate growth.

A.6 Financial Crises in the Nordic Countries

The Nordic countries; Norway, Sweden and Finland all experienced serious banking crises in the early 1990s preceded by major asset booms and busts in the 1980s. In each country the run up in asset prices followed liberalization of their financial sectors after five decades of extensive controls on lending rates and government control over the sectoral allocation of bank lending. Asset booms were accommodated by expansionary monetary policy as each country adhered to pegged exchange rates which tended to make monetary policy pro-cyclical.

In the case of Norway, quantitative restrictions on bank lending were lifted in 1984 without allowing interest rates to rise. Real interest rates were low and sometimes negative. Banks used their newborn freedom to expand lending on a large scale, all of them with a firm desire to increase their market shares. This stimulated a massive real estate boom until 1986. The legacy of the real estate boom and buildup in bad assets in the commercial bank was a banking crisis in 1991. It was resolved with a fiscal bailout and ample central bank liquidity (Steigum 2010, Øyvind, Klovland, and Øksendal 2016).

Similar stories occurred in Finland and Sweden (Jonung et al 2009). Their crises and recessions were much worse than in Norway largely because their currencies were pegged to the DM in the EMS System and they were hard hit by tight German monetary policy in reaction to the high fiscal costs of German reunification. Sweden was hard hit by the EMS crisis in 1991. To defend the krona the Riksbank raised the discount rate to 500%. The policy was unsuccessful and Sweden was forced off the EMS and forced to float in 1993. The currency and banking crises of 1991 rocked the Swedish economy. The banking crisis was resolved using the good bank bad bank model mentioned above in the discussion of the Baring and Comptoir d'Escompte crises in the nineteenth century. The final resolution costs were quite modest.

A.7 The US Subprime Mortgage Crisis and the Global Financial Crisis of 2007-2008

The U.S. subprime mortgage crisis and the Global Financial Crisis that followed has been viewed as the worst financial crisis since the 1930s. It affected the U.S. and several European countries and Japan and led to a global recession.

The subprime mortgage crisis in the U.S. of 2007-2008 had its origins in a massive nationwide house price boom that began in the 1990s.³⁴ The US has had a long history of house price boom busts but all of them were local or regional (Glaeser 2013).

The causes of the recent crisis include: government policy to encourage housing for a broad swath of the population, loose monetary policy after the tech boom of 2001 to prevent the U.S. from slipping into Japan style deflation, and global imbalances as the newly emerging countries of Asia invested their growing international reserves in safe U.S. Treasury securities. The push to encourage housing in the US and other countries goes back to the Great Depression of the 1930s when the Roosevelt administration set up the Federal Housing Authority (FHA) and the GSEs – Fannie Mae and Freddie Mac—to encourage the development of the mortgage market and to provide housing for much of the population. In subsequent decades and especially in the 1990s, as argued by Rajan (2010), successive government administrations and Congress, as an attempt to reduce rising inequality and income stagnation, pushed for affordable housing for low income families using the GSEs and allowed them to reduce their capital requirements. This led the agencies to take on more risk. Lending was encouraged and rising prices raised the GSEs profits leading them to take on more risk (Poole 2016). The FHA in the 1990s also took on riskier mortgages, reduced the minimum down payments to 3% and increased the size of mortgages that would be guaranteed.

The housing boom came to fruition in the George W. Bush administration which urged the GSEs to increase their holding of mortgages to low income households (Rajan 2010, page 37). Between 1999 and 2007 national house prices doubled according to the Standard and Poor's Case-Shiller repeat sales index.

³⁴ See Bordo and Meissner 2012

The private sector also contributed heavily to the boom in an environment of loose regulation and oversight as they recognized that the GSEs would backstop their lending. During this period lending standards were relaxed and practices like NINJA and NODOC loans were condoned. These developments led to the growth of the subprime and Alt A mortgages which were securitized and bundled into mortgage backed securities and then given triple A ratings. Mortgage backed securities (MBSs) were further repackaged into collateralized debt obligations (CDOs) Credit Default Swaps (CDSs) provided insurance on many of these new products. Financial firms ramped up leverage and avoided regulatory oversight and statutory capital requirements with special purpose vehicles (SPVs) and Special Investment Vehicles (SIVs). Many of these entities were not part of traditional commercial banks under the supervisory umbrella of the Fed or the FDIC. They were referred to as shadow banks.

These factors encouraged a lending boom and house price boom which peaked in 2006. The boom was fueled by expansionary monetary policy by the Federal Reserve after the tech boom bust of 2001 . Low policy rates were kept in place until 2005 to prevent the economy from slipping into Japan style deflation (Taylor 2007). Also, the low interest rate environment of the Great Moderation encouraged risky investment. An additional expansionary impulse may have come from the Asian savings glut (Bernanke 2005). As China and other countries pegged their currencies at undervalued rates relative to the dollar to encourage export driven growth, they accumulated huge international reserves which were invested in safe US Treasury securities. This imbalance allowed the US to run a persistent current account deficit which provided fuel for the

boom³⁵. The house price boom turned into a bust in 2006 following the Fed's return to a tighter monetary policy stance.

The crisis erupted in the summer of 2007 in shadow banking entities (SIVs) that had been heavily exposed to mortgage backed securities, and then spread to the off balance sheet vehicles of commercial banks both in the U.S. and Western Europe. This led to a drying up of interbank lending precipitated by uncertainty about which institutions were exposed to derivatives containing risky mortgages on their balance sheets (Schwartz 2009).

The challenges the Fed faced in managing the crisis was to overcome the long standing stigma problem which went back to the 1920s and made commercial banks reluctant to go to the Discount window (Gorton and Metrick 2013)³⁶. The Fed initially dealt with the liquidity crisis in the interbank market by easing the terms of access to the discount window, but as the crisis deepened and there were few responses, it established the Term Auction Facility (TAF) in December 2007 under which the Fed auctioned credit to depository institutions for up to three months to circumvent the ongoing stigma of turning to the discount window.

The crisis worsened in March 2008 with the rescue of the investment bank Bear Stearns, by JP Morgan, backstopped by funds from the Federal Reserve. The rescue was justified on the same grounds as earlier bailouts, that Bear Stearns exposure to counterparties was so extensive that a worse crisis would follow if it were not bailed out.

The March crisis led to the creation of a number of new discount window facilities which broadened the collateral available for discounting such as the Term Security Lending Facility (

³⁵ The U.S. current account deficit did expand in the early 2000s, indicating that more foreign capital entered the U.S. on balance during these years, but a capital inflow was not the driving force. If it was the dollar would have appreciated, but the dollar depreciated between mid 2001 and March 2007.

³⁶ See Bordo 2014.

TSLF) under which Treasury Securities were loaned to primary dealers against eligible collateral. These facilities were created under Section 13(3) of the Federal Reserve act established after the Great Contraction. It was the first use of section 13(3) since 1936 (Hackley 1973). It was followed by the Prime Dealer Credit Facility (PDCF) also justified under Section 13(3) , to provide cash to investment banks and other primary dealers on terms close to those available in depository institutions (The Federal Crisis Inquiry Report, 2010 page 294).

Events took a turn for the worse when the Treasury and the Fed allowed the investment bank , Lehman brothers, to fail to discourage the belief that all insolvent institutions would be saved in an attempt to prevent moral hazard (See FOMC Transcript September 16, 2008 pages 36, 48, 49, 51). It was argued that Lehman was in worse shape than Bear Stearns and hence was a weaker candidate to be rescued and moreover that it was less exposed to counterparty risk than Bear Stearns and hence posed less of a systemic risk threat. After the crisis, Bernanke (2012) argued that Lehman was allowed to fail because it was deemed insolvent and because the Fed lacked the legal authority to rescue it.³⁷

The next day the Federal Reserve (using section13(3) to justify an \$85 billion loan) and the Treasury bailed out (for a total package of \$182 billion) and effectively nationalized the insurance giant AIG fearing the systemic consequences for collateralized default swaps if it were allowed to fail. The fallout from the Lehman bankruptcy then turned the liquidity crisis into a fully -fledged global credit crunch and stock market crash as interbank lending and the whole elaborate network of funding for the shadow banking system effectively seized up on the fear that no institutions

³⁷ Ball (2016) presents convincing evidence from his forensic accounting exercise that indeed Lehman's was solvent and could have been saved. There is an historical parallel here between the Overend Gurney Crisis of 1866 and the Baring Crisis of 1890. The balance sheets of the two banks were not dissimilar yet one was saved and a panic averted and the other was not leading to a huge panic.

were safe. The financial crisis then contributed to a massive global recession—the Great Recession.

To stem the post Lehman financial market panic the Fed invoked Section 13(3) of the Federal Reserve Act to extend the discount window to non- bank financial institution and financial markets such as in the Term Asset Securities Loan Facility (TALF). The Fed created special liquidity facilities to provide funding to the money market mutual funds which were hard hit by the collapse of Lehman (the Money Market Investor Funding Facility, MMIFF) and then to the commercial paper market that was funded by the MMMFs(the Commercial Paper Funding Facility, CPFA) . Facilities for broker dealers, asset backed securities and many other institutions and markets were created. The Fed also cut its policy rate close to zero.³⁸

The crisis ended in the late fall of 2008 and early spring of 2009 when TARP funds from the Treasury were used to recapitalize the major banks after a series of stress tests administered by the Fed. The international crisis eased after the Fed in October 2008 set up extensive inter central bank swap lines to keep international liquidity flowing.

A.8 The Eurozone Crisis

The Eurozone Crisis of 2010-2014 was a sequel to the Global Financial Crisis of 2007-2009. It involved strong connections between banking and fiscal crises.³⁹

In the aftermath of the subprime mortgage crisis, several European countries that had been connected to the US crisis or which had bank credit driven house price booms engaged in

³⁸ Bernanke (2012) justified the extension of access to the discount window as perfectly consistent with Walter Bagehot’s strictures because they were backed by collateral(although not made at a penalty rate). These policies he argued prevented the collapse of the global financial system.

³⁹ See Bordo and Meissner 2016.

expensive bond financed bank bailouts. These bailouts and economic collapse increased the fiscal deficit leading to debt surges. To fight the recession that accompanied the crisis, many countries engaged in automatic fiscal policy which also increased the deficits.

Against a background of weakening fiscal positions across the Eurozone, the announcement in 2009 that the Greek government had falsified its fiscal books set the stage for the Eurozone debt crisis which first involved the threat of a Greek default and then contagion to other members via their banks which had significant holdings of Greek and other peripheral countries sovereign debt. The threatened sovereign default by Greece fed into a banking crisis because banks in Greece and the other financially integrated Eurozone countries held large amounts of Greek and other peripheral Eurozone sovereign debt. In the case of Ireland, a blanket guarantee of the Irish financial sector followed the collapse of a property price boom. This collapse made the Irish banks insolvent, and led to a fiscal crisis because markets expected that the Irish government would not be able to service the large run up in its debt that followed. An 85 billion euro international rescue by the IMF, the EU and others followed in 2010. Later some private sector actors were bailed in. In Spain, where another housing boom turned to bust, the crisis also led to fiscal problems. Spain introduced several costly bailout packages with enhanced guarantees, and took on a European bailout package. Throughout, international pressure—both political and market based – was harsh leading to higher risk premia. From 2010, Spain adopted a series of ‘austerity’ plans consistent with these bailouts. In addition, Spanish banks increased demand for Spanish sovereign debt in order to take advantage of liquidity funding from the European Central bank, threatening an outcome whereby fiscal problems could be transmitted to the banks. Bond spreads in Portugal and Italy spiked after 2010, but countries such as France and Belgium also faced significant bond market pressure.

The debt crisis spread to all of the Eurozone peripheral countries in 2011-2013. The Troika (ECB, Eurozone government and IMF) rescued bailed out Greece, Spain, Portugal and Cyprus although the private sector was also bailed in in varying degrees in each country.

European countries displayed vulnerabilities in the run-up to the crisis, but the collapse of confidence in international bond markets for many European countries reflected the constraints of nations in a monetary union and (at least initially) hesitant monetary policy from the ECB.⁴⁰ The crisis was finally resolved by the actions of the Troika and by Mario Draghi's speech in 2012 where he said that the ECB would do whatever it takes to calm the markets.

⁴⁰ See Brunnermeier, James and Landau (2016), and Mody (2018)