

# Shadow credit, the Fed and the Crash of 1929

Rasheed Saleuddin\*

10 November 2020

## Abstract

In the 18 months leading up to the crash of 1929, an unprecedented 30 to 40 percent of all share investments in the U.S. were purchased using non-bank private “shadow” credit available on the floor of the stock exchange. The credit pyramid that occurred outside of the traditional money and banking markets was the direct result of corporations and trusts lending the proceeds of newly issued securities to speculators who were buying these same shares and bonds. This system was uncorrelated to and separated from traditional monetary markets and central bank monetary policies. Though the US Federal Reserve has been blamed for not “leaning against” the 1928-9 bubble in the stock market, it had no effective monetary tools to limit speculation and therefore was irrelevant to the market for speculative credit, rather than apathetic or incompetent.

**[Draft – Do Not Distribute]**

JEL: E58, G01, N22, N42.

Keywords: crash of 1929, shadow banking, stock market bubble, call loans, margin lending, Federal Reserve

---

\*University of Cambridge. Email: r.saleuddin@jbs.cam.ac.uk

The author benefitted from the research assistantship of Lindsay McGrath. Thanks to Bill Janeway, Walter Jansson, Craig McMahon, Alain Naef and the participants at the 2020 INET YSI Plenary for their comments on earlier versions.

## Introduction

The U.S. in 1929 remains in the minds of the general investing public and academics as the quintessential stock market boom and bust (Quinn and Turner 2020). Several bubbles and corrections in recent years have resulted in tremendous costs to society, yet there are actually few stock market crashes for economic historians to study. It is, therefore, worth examining 1928-9 to determine what, if anything, regulators, supervisors and central banks could have done to avoid the instabilities that led to the Crash of 1929 (Crash). The causes and effects of the bull market preceding the Crash remain heavily debated in the literature and the mainstream press (Bruner and Miller 2019; Waxman 2019). That speculative excesses evident in 1928-9 resulted in part from unprecedented technological developments is generally not questioned (Fisher 1930; McGrattan and Prescott 2004). What is often debated in the literature is the degree to which price movements on the pre-crash New York Stock Exchange (NYSE) were credit-driven. Models of credit-fueled speculative forces causing booms and busts are common (Scheinkman 2014), and freely-available credit exacerbated speculative tendencies as early as 1720—the first recorded financial bubble—and as recently as 2006-7 (Di Maggio and Kermani 2017; Braggion, Frehen and Jerphanion 2020). While Galbraith (2009 (1954)), Kindleberger (2011 (1978)), Fisher (1930) as well as U. S. Senate Reports and Hearings (1932, 1933, 1934, 1935) suggest that private credit supplied to the NYSE was a major influence on the market boom and bust, more recent scholarship generally rejects this argument (White 1990, 68; Bruner and Miller 2019, 53).

Friedman and Schwartz (1963, 297-8) and others (Meltzer 2003; Mishkin 2008) fault the U.S. Federal Reserve (Fed) as central bank for holding its discount rate too high to support a slowing real economy, but not raising rates enough to curb the speculative lending on the NYSE. In this interpretation the Fed should have “leaned against the wind” (Allen et al 2017) by increasing rates rapidly in 1928 to discourage private money entering the stock market, and decreased rates in 1929 while the economy was slowing. In fact, the Fed did the opposite, and kept rates low until the NY Fed finally convinced the Board to allow a rate increase in the summer of 1929. That is, not only did the Fed contribute to the build-up of speculative credit and therefore the so-called stock market “bubble” but also may have influenced the Crash by raising rates “too late”. As Fed discretion had been a failure, those who follow Friedman and Schwartz believe, the prescription is to force the Fed, or its replacement, to follow simple rules setting money supply to output and/or price targets (Freidman 2013; White 2017). Those who believe in this interpretation further suggest automatic monetary policies such as the use of a Taylor (1993) Rule or a Freidman (1969) Rule would have avoided both the Crash and the long-enduring recession-turned-depression that began in 1929.

Identifying the source of the so-called stock market bubble and its effects is important in that it determines

our evaluation of the Fed's response versus the optimal policy prescription. If speculative lending had little to no effect on the late stage stock market bubble, then the correct policy was that followed by the Fed, which was to dissuade Federal Reserve credit from supporting speculation, and to act as lender of last resort during the Crash. If, however, the loan market directly led to increased speculation, then there were two alternatives available to authorities. If rediscount rate changes could have affected the market, then the Fed may have made an error by not raising rates until the summer of 1929. Raising rates earlier, of course, might have caused more damage to the real economy. If, however, the brokers' loan market had decoupled from other rates including the Fed discount rate, only macro-prudential regulation by government or voluntary restraint by industry could have controlled the flow of credit to the stock exchange.

Several facts surrounding the rise of speculative credit on the NYSE require explanations. Firstly, the extraordinary rise of US common stocks beginning in 1928 occurred in spite of tight monetary conditions in the U. S. (Friedman and Schwartz 1963, 290). Rates had risen in 1928 even as the US economy was growing much less rapidly than previously. Real rates, in fact, were even higher than nominal rates due to the slight deflation experienced in the late 1920s. Loan growth in the banking sector was slow at best, while money stock in the US fell in the late 1920s. The second key observation to be explained is the fact that the interest rate on speculative credit did not rise as would otherwise be predicted given both the huge increase in quantity of loans demanded and tight monetary conditions elsewhere. How and why did new credit enter the market even as the Fed was discouraging bank lending? Finally, why did rates not rise during the Crash, as they had during previous panics such as 1907?

This paper finds that the credit market on the NYSE was fueled by a feedback loop that allowed new private money creation, the first Fed experience of shadow banking, effectively bypassing bank credit markets and therefore Fed control. Beginning around the middle of 1928, speculators invested heavily in new securities of US corporations and trusts, and the treasurers of these companies then lent the proceeds of the new issues back to existing or new speculators to purchase more new issue securities, and so on. There exists both quantitative and qualitative evidence (historical narratives and reports) of such a feedback loop: Large corporate borrowers were often significant lenders on the NYSE (Parker 1929; *New York Times*, 13 February 1929; Snyder 1930; Haney et al 1932; Eiteman 1932; U.S. Senate 1934).

This new almost unlimited supply of credit put a damper on rate rises such that demand was not stifled. This shadow banking market involved speculators borrowing in the short-term money markets to invest for the long term, with the collateral used to secure the loans marked to market on a daily basis (Mehring 2010; Eichengreen 2015).<sup>1</sup> This was also a quintessentially if unintentional Ponzi finance, or pyramid, scheme

---

<sup>1</sup> The shadow banking treated herein is unrelated to the "shadowy" banking by non-Fed member banks post-Crash (Mitchener and Richardson 2013).

(Minsky 1991): borrowers were not able to earn enough in dividends to cover the cost of borrowing and relied on ever increasing stock prices for the economics of “borrowing to invest” to function. Once the music stopped—and price growth failed to meet expectations—the leverage would need to be unwound, resulting in “fire sales” of financial assets (Shleifer and Vishny 2011). This risk of “destabilizing... mutually reinforcing... liquidity spirals” is often highlighted as a major flaw of shadow banking markets (Bogen and Kroos 1960; Brunnermeier and Pedersen 2008; Gorton and Metrick 2012). While the borrowers were taking ever more liquidity risk, corporations and trusts were engaging in risk-free arbitrage: borrowing long-term from speculators and investing short term at a profit.<sup>2</sup> This was a money machine for both parties, limited only by the ability of speculators to put up more deposits in the form of margins on their stock market investments. This self-reinforcing provision of private credit almost completely outside of the banking system compensated for generally tightening money supply credit in the US.

In order to show that the private credit market on the NYSE was beyond the control of the Fed, I first reveal that interest rates on the NYSE became uncorrelated with money market rates under the control of the Fed by 1929, and perhaps even by the middle of 1928. Speculative loan volumes increased in the face of an otherwise binding constraint in the shape of Fed and bank credit, and so rates on the NYSE rose as would be expected in proportion to the new demand up until 1929. Speculative lending rates in 1929, however, plateaued and even fell slightly. I show that arbitrage opportunities available to U.S. non-bank corporations are associated with this dampening effect on the otherwise expected exponential path of rates that would have existed if credit was finite, stimulating demand for increasing leverage. Archives further reveal that corporations well understood the arbitrage and were active participants, lending to NYSE speculators with money raised on that same market. The decoupling, the tempered rise in rates beginning in 1928 and evidence of excessive new issues and subsequent loans by corporations to speculators on the NYSE are all evidence that a private credit bubble existed on the NYSE that was likely a significant if not primary factor in the rise of the stock market in the late 1920s. As the Fed could not have affected the arbitrage opportunity for US corporations and trusts using interest rate policy, it should be held blameless for the late-stage bull market and the Crash in 1928-9.

This case therefore provides an important lesson for policymakers attempting to avoid future shadow banking crises: Monetary policy lost its effectiveness during this period of rapid private credit creation outside the banking system. Such shadow banking markets need to be monitored carefully by regulators and industry. Only macroprudential control or industry self-regulatory action could have influenced the credit market that developed.

---

<sup>2</sup> Where banks generally engage in maturity transformation, or “borrowing short to lend long”, corporations at the time were borrowing long to lend short, reverse maturity transformation (Pozsar and Singh 2011).

## Brokers' Loans and Margin Lending

Margin lending allows those buying stock to fund some of the purchase price using borrowed money. Margin deposited in cash is required upon settlement of any leveraged purchase of securities by a customer. The securities purchased by the customer are used to collateralize the margin loan from the broker. The collateral backing the margin loan is valued daily upon the close of the exchange. Should the price of the collateral fall such that the required margin needs to be replenished, a margin call is issued, and the customer must provide more cash in the form of maintenance margin or risk the stocks being used as collateral seized and sold to repay the loan from the broker. In volatile periods in the 1920s, a margin call could be made in the middle of the day (Meeker 1922).

Before the Great Depression, the brokers making margin loans obtained the required funding on the NYSE by borrowing in the brokers' loan market. New York banks had been the provider of these funds to the market up to the mid-1920s, but by 1927 it was non-banks, generally cash-rich corporations, who were making so-called "bootleg" (non-bank) loans to brokers, creating an early version of what we now refer to as shadow banking (Figure 1).

Brokers borrowed money from banks and others for a fixed term ("for time") or overnight ("on call"). Lending on call was the most liquid U. S. money market. Lenders could make the decision whether to call the loan or renew the loan every morning. Time loans, often for 60- to 90-days, faded in importance over the 1920s, but—like call loans—the collateral was marked to market on a daily basis. As such, lenders for time had only exposure to overnight moves in their collateral package (Meeker 1922, 173, 190). As overnight lending, generally renewed daily, dominated loan volumes, a brokers' loan is often referred to generically as call money.

Bank and non-bank lenders took physical possession of the stock and bond certificates purchased by the brokers' customers as loan collateral. If the marked-to-market value of the collateral securities fell, a call loan would could not be renewed by the broker, or a time loan permitted to continue, until margin was restored to its initial requirements. If no adjustments were forthcoming by the borrowing broker, the lender could sell out the shares it physically owned in order to repay itself and terminate the loan.

### Figure 1: Brokers' loan volumes

The brokers' loan market of the late 1920s was enormous compared to the present day. Margin lending in the U.S. is currently approximately three percent of market capitalization (Fortune 2001; Reuters 2020). By October 1929, however, somewhere between 30 percent and 40 percent of the market capitalization of the NYSE was subject to margin borrowing (*Wall Street Journal* 21 February 1930, 17; Roelse 1930 110; Harris

1933; U. S. Senate 1934, 1314; Sobel 1965, 131). Leveraged holders were an overwhelmingly large percentage of daily volume. It would have taken two weeks of the extremely high-volume day of 30 October 1929 to liquidate margin loans to repay all of the borrowing outstanding before the Crash (volume data from Eiteman 1932, 683). In 1929, the exit door was small and the theatre was at full capacity.

### **A regime change in the brokers' loan market**

The banking and money markets of the 1920s were very simple compared to the present day. Banks could take demand and time deposits, which were not subject to deposit insurance at the time, and lend short or long term to corporations, or buy US Treasury or other bonds. The Fed, as per its 1913 mandate, allowed member banks to obtain funding by pledging their eligible investments to the central bank in exchange for reserves on deposit at the Fed. The rate at which the Fed would provide funds to banks that were members of the system was called the rediscount rate, and it was generally set just above the market rate for alternative bank investments. Besides making loans or providing mortgages, banks could purchase commercial paper (CP), short term debt issued by corporations, or "accept" short term paper used as credit for international trade, called bankers' acceptances (BAs). Alternatively, they could purchase long term securities such as US Treasuries and bonds issued by corporations and foreign entities. As these latter two assets were long term (short term Treasuries were not available at this time), banks would be taking added risk, and such rates were not related to short term alternatives such as BAs or CP.

Sometime in the 1920s, the Fed began to realise it could affect market interest rates by buying and selling government securities in open market operations (Meltzer 2003). If all bank money is fungible and discounts can indirectly be used to lend to the brokers' loan market, money market rates, including bank lending into the brokers' loan market, should track each other rather well: banks can choose whether to fund using the discount rate or deposits and lend in the CP, bankers' acceptance or brokers' loan markets. They also may buy Treasury and corporate bonds. Banks with access to the Fed for added liquidity should therefore be able to arbitrage away any rate premium unrelated to credit or interest rate risk. Time loans, being ultra-safe for the lender, should therefore not command a rate premium if liquidity is unconstrained. In normal circumstances, corporations would have been reasonably insensitive to rate changes in the call loan market, as there was really no alternative for cash management. Brokers' loans were safer than bank deposits, which at that time were uninsured. In fact, no other riskless short-term asset existed, as Treasury Bills were not issued by the U.S. until after the Crash. The BA rate is the price of short-term (90 day) funding by a Fed member bank for high quality paper, and is therefore more useful than commercial paper rates that also include corporate credit risk.

That the discount rate and all other money market rates are highly correlated to time and call money up until 1928 (Figures 2 and 3) is indicative of money market fungibility as well as the indifference of the corporate treasurer.<sup>3</sup> While all other money markets continued to follow the Fed rediscount rate in 1928-9, however, the brokers' loan time and call money rates began to increase in 1928 until they plateaued in the middle of 1929.

In order to address the changes that were affecting the stock and credit markets in the late 1920s, weekly and monthly data were obtained from FRED/ALFRED (money market rates, brokers' loan rates and volumes, corporate bond rates, price/earnings ratios), Wharton Data Services (the Dow Jones Industrial Average) and the *New York Times* (brokers' loan volumes, new issuance, individual equity prices). One potential problem with any analysis is high correlations between key variables. Unsurprisingly, total brokers' loans are highly correlated with total market capitalization. Brokers' loan rates are also highly correlated with brokers' loan volumes (Table 2). Simple linear regression over the period covered here can lead to oversimplifications. This paper focuses on the changes in the markets that occurred in 1928 that likely significantly influenced the pre-Crash "bubble" and subsequent Crash in 1929.

**Table 1: 1926-1931 Key variables**

**Table 2: 1926-1930 Correlations**

**Figure 2: Call loan rates v NY Fed discount rate, monthly**

**Figure 3: Time money versus Commercial Paper, weekly**

I regressed both time loan rates and call loan rates on the BA rate and the volume of NYSE lending by others for the period from January 1926 to October 1929. Accurate and regular broker loan volumes were not always available before 1926. As there is significant autocorrelation in all of the rate time series, I have tested significance of the coefficients using Newey-West standard errors. Bai Perron (2003) tests for structural breaks reveal one such change in the call rate series (April 1929), and three in the time money series (late 1926, autumn 1928 and spring 1929).

---

<sup>3</sup> The strong and 99.9 percent significant relationship between the discount rate and the call loan rate completely disappears when evaluated using a Bai Perron (2003) test after August 1928, with insignificant coefficients and a zero R-squared.

Before 1929, both time and call money are significantly correlated with both the BA rate and the volume of brokers' loans made by others (Figures 1, 2 and 4, Table 1, sections A and B). However, as broker's loans by others rose later in 1928, call and time rates rose more than the money markets as measured by the BA rate. If money was truly fungible, why did brokers' loan rates rise almost exponentially in the latter half of 1928?

Rappoport and White (1993; 1994) explain the 1928-9 rise in brokers' loan rates as evidence of a bubble in the 1928-9 stock market and an expectation of a crash. At the levels of margin reported by both of these papers and Smiley and Keehn (1988) of 30 to 60 percent, it can be shown that credit risk is very low in brokers' loans. As was found by Fortune (2000; 2001) for modern times, the likelihood of the put embedded in any call or time loan being in the money is extremely low. There was no three-month period before the Crash that would have resulted in a loss to brokers' loans and anything resembling the margins identifies in the literature. Another way to think about high margins is that call and time loan pricing using credit risk models concludes that lenders are *always* pricing in, and therefore in some sense "expecting", extreme tail events—events that never occurred in stock exchange history. That is, lenders were more than compensated for any crash that occurred in the history of the US stock market, including 1929, 1987, 2001 and 2008. High margins are terribly important for the call loan market: they allow lenders with little understanding of credit or market risks to ensure that their money is safe at all times (Gorton and Pennacchi 2010). De-coupling can therefore not be explained by risk aversion by lenders.

Simple supply and demand theory as well as the empirical evidence would suggest that the demand for brokers' loans—in this case as measured by volumes should have an impact on brokers' loan rates. NYSE rates should be therefore dependent on bank money market rates, but excess demand that cannot or will not be filled by banks and must be sourced from "others", who would only add credit if incentivized to do so by a rate premium. The evidence reveals that up until nearing the end of 1928, time loan rates are almost one-for-one varying in the BA rate, with a strong and significant affect from non-bank speculative lending: Intercepts are small, the BA rate coefficient is near one and the loan volume coefficient indicates around an 0.80 to 1.1 percentage point increase in rates for every \$1 billion increase in brokers' loans (Figure 4). R-squared are very high, indicating that the rate and non-bank volumes explain a good deal of the rate movement. For call loans, the relationship is smaller but still statistically significant at the 0.001 level. There is an abrupt change in regression results in late 1928 (for time loans) and early 1929 (for call loans). The breakdown in correlations between money market rates and the influence of brokers' loan volumes arrives in late 1928 for time money and early 1929 for the call loan market (Table 1, sections C and D and Figure 4).<sup>4</sup> After this, R-squareds go almost to zero (Table 1, section D) for time loans, indicating other forces may be explaining brokers' loan rates in 1929. Rates and volumes no longer had a significant relationship with brokers' loan borrowing costs, which is difficult to explain given the increased volumes in the market (increased demand) in the face of Fed

---

<sup>4</sup> This divergence between other money market rates and the time loan market did not occur during the depression of 1920-1 (Figures 2 and 3).

constraints on speculative credit. What explains the regime change in late 1928/early 1929? If rates no longer rose as demand increased, the only conclusion can be that new supply of speculative credit entered the market. But NY and out-of-town bank lending did not increase. New lenders must have entered.

### **Table 1: Regression results and Bai Perron tests**

### **Figure 4: Time money, October 1928 – October 1929**

The abrupt growth in brokers' loans made by (non-bank) "others" in 1928 was in excess of the relationship with the market capitalization of the NYSE before 1928 (Figure 5), with the relationship completely breaking down after the summer of 1929. The growth in brokers' loan demand by speculators was hardly irrational, given that the cost of borrowing on call or for time was far less than the returns stock market investors had experienced throughout the boom of the late 1920s. Bank credit supply, however, was constrained not only due to tight money markets (Friedman and Schwartz 1963) but also a Fed program designed to put pressure on NY Fed member banks to reduce lending to the stock market. The growth in brokers' loans by 1926-7 concerned the U.S. Federal Reserve Board as well as Congress, with the latter holding hearings on the subject in 1927. The "real bills doctrine" followed at the time prohibited the use of Fed credit for speculative purposes. The Fed responded to the build-up primarily through direct action, a kind of moral suasion which included letters to banks reminding them that lending on the NYSE should not be funded by Fed rediscounts. The action worked to some extent. NY Fed member bank lending was constant to slightly lower through the key 1928-9 years (Figure 1). As NY Fed member banks could not increase lending to the NYSE, the only marginal source of credit for the stock market was the non-bank sector.

### **Bootleg lending and the new issue market**

Increasing demand combined with constrained supply should have raised broker loan rates, and this combination did have that result in early to mid 1928 (Figures 2 and 3). Indeed, this might have been the end of the story, and speculative borrowing would have been curtailed by the rising cost of funds, limiting leverage and likely tempering the 1928-9 raise in the stock market. This did not happen. In fact, after the summer of 1929, brokers' loan rates stabilized even as volumes were increasing.

The most obvious difference between 1921-7 and 1928-9 was the explosion in new securities issuance on the NYSE, which grew much faster than the real economy and much higher than issuance was when the NYSE indices were lower (Figure 5). Companies could raise funds on the NYSE at historically low rates and high equity prices at the same time that demand for leveraged investments rose.

### **Figure 5: New issues v. DJIA level**

**Figure 6: Baa corporate rate and DJIA price/earnings ratio, 1921-October 1929**

**Figure 7: New issuance (non-refunding) on the NYSE, 1927-29**

**Figure 8: Baa bond yield and commercial paper vs time money**

Why this burst in new issuance on the NYSE? By 1928 the demand for brokers' loans had driven the brokers' loan rate well above the cost of capital and debt for all but the weakest corporate and trust borrowers (Figure 6). A corporation could issue a new bond, preferred share or common share and invest the proceeds in the brokers' loan market on a riskless basis, for a risk-free profit. Borrowing in the bond market was not the only option for corporations in 1928-9. Equity valuations were the highest they had been in history. In fact, equity price/earnings ratios did not again reach the heights of 1929 until the dotcom bubble of 1999-2000. By September 1929, the cyclically adjusted price earnings ratio (CAPE, see Shiller 2000) for the Standard & Poor's composite index was 32.56: earnings were less than 5 percent of the market capitalization of the average large company. Firms could raise common equity, lend these funds into the call money market risk-free, and receive a higher return than from investing in their own business.

By "borrowing long to lend short", a reverse maturity transformation, a risk-free arbitrage opportunity was created, one that corporate treasurers and trust managers were keen to exploit. Borrowing and capital-raising by corporate treasurers were not always destined for the real economy, but were often used to fund the purchases of more securities—including and especially new issues—on the NYSE. Thus a money machine developed (Snyder 1930). Private credit could grow outside the banking system by simply being recycled through the stock market. Investor A could borrow from Corporate A to buy equity or bonds in corporate B. Corporate B could use these same funds to lend to Investor B, who could in turn buy equity or bonds in corporate C. This could occur over multiple loops, limited only by the supply of margin capital by investors (Figure 9).

**Figure 9: Pyramiding credit**

The feedback loop on the NYSE put a ceiling on rates while at the same time created a private money machine. While the demand for credit was determined by expectations in the stock market, the supply was based primarily on the difference between funding rates in the new issue market for non-bank US corporations and lending rates in the brokers' loan market. Lending decisions were made based on the demand for credit and the arbitrage available in the new issue market. The growth in lending would, therefore, be unaffected by other, short-term, rates. That brokers' loan rates decoupled from other money market rates by early-to-mid 1928 suggests that the market separated from Fed control.

If market growth was due primarily to a newly-available arbitrage between corporate cost of funds and a buoyant new issue market one would expect to see supply curves push out to the right (see stylized examples in Figure 10), explaining the S-shaped curve of rates as a function of volume.

**Figure 10: Time loan rate versus loans by others, black lines indicate stylized supply curves**

NY Member banks (at around a constant \$1 billion during the late 1920s), some non-member banks and genuine liquidity management on the part of non-banks together can meet almost all of the demand for brokers' loans around \$3-4 billion. Non-banks as price-takers compete with banks at lower demand levels. As such, rates do not vary much around the Fed discount rate or other short-term bank credit markets. This is because Fed member banks can arbitrage away the difference, as they likely did up until mid-1998. Here the Fed would have some ability to influence brokers' loan rates, as the banks are able to allocate between different money market instruments. If, for example, the rediscount was raised in a credit constrained market like in 1924, banks would reduce brokers' loans and seek higher-yielding assets. Note that at these lower rates, there is no incentive for corporations to enter, other than to place temporary excess liquidity. Above this level of brokers' loans, the supply curve is inelastic, as any bank lending in excess of historic figures risked attracting the wrath of the Fed Board. We see the inelastic supply curve as the constraint as broker loans by others rise by 50 percent to \$2 billion by the autumn of 1928. The Fed was well aware of the issue at the time, trusting in the market to self-correct through the call money rate (Strong papers 1927-1930, 8).

By 1929, however, the corporate treasurers and investment trust managers could begin to arbitrage by borrowing in the bond market and lending on the NYSE, the time rate plateaus to a significant degree, even as both brokers' loan rates remain highly volatile (Figures 2 and 3). Loans by others almost doubled between January and October 1929, yet the spread of time rates over BAs had not significantly altered (Figure 10). This indicates that a money machine effect (Figure 9) may have been at work by the end of the year. Certainly, there was an increase in supply from the corporates.

Narratives of the procyclical feedback loop described above abound. Contemporary newspapers and academic work identified lending by corporations who had immediately previously raised funds in the market (Parker 1929; Snyder 1930; Haney et al 1932; Eiteman 1932, 688). Investment trusts were also known to be big lenders in the call loan markets (*New York Times*, 13 February 1929). The U.S. Senate (1934) produced a sample of cases of arbitrage as part of its investigations into non-bank brokers' loan lending. Cities Service Co. raised approximately \$ 170,000,000 in stocks and bonds from March 1928 to March 1929 and had a maximum amount lent in the call loan market of \$41,900,000, with an average daily exposure of \$10,000,000 (U.S. Senate 1934, 6319). Loans were made direct to borrowers, bypassing the banking system. Electric Bond & Share itself lent on average \$100,727,100 every day in 1929, with a maximum exposure of over \$187 million.,

while many of its controlled subsidiaries, such as American and Foreign Power Co. were also big lenders. It was also a significant issuer of common equity in 1928, raising at least \$120,000,000 (U.S. Senate 1934). Standard Oil of New Jersey appears to have committed an average of \$100,000,000 per day. Bethlehem Steel lent a peak amount of \$157,000,000 in 1929, having raised approximately \$ 350,000,000 in new equity that year. Parker (1929) identifies many other companies who dealt in brokers' loans, including Du Pont, Goodyear, International Nickel, and Westinghouse. Lutz (1945) found that there was a rise of about 30 percent marketable securities held by non-bank corporations, which included call loans, from early 1928 to the end of 1929. He concludes that the new money raised on the NYSE during the late stage of the bull market securities must have been invested in bonds and lent on call. Corporations were now in the (very profitable) lending business.

The Fed monitored these flows on a daily basis, and by the middle of 1928 was extremely concerned about the degree of corporate involvement in the market (Burgess in the Strong papers 1927-9). The practice was so prevalent that it was remarkable when large listed companies did not lend on call (*New York Times*, 4 February 1929; *Barrons*, 11 February 1929). The time money rate was well above the issuance rate for the lowest rated borrowers by then (Figure 8).

There exists other evidence that it was a recycling of funding through the stock market that resulted in the build-up for brokers' loan credit. Snyder (1930), head of the Fed Board's statistics department in the late 1920s observed that velocity rose significantly in 1928-9 while deposits in NY banks remained static. If it was foreign or other lending sourced from outside New York that was entering the NYSE funding market, then the deposit base of NY banks would have risen, but did not do so. It is worth keeping in mind that loans from "others" were greater than the entire physical money supply of the U.S. at this time. Surely if was money from abroad, it would have shown up in NY bank deposits, yet these did not vary outside of a range of \$4 billion to \$5 billion between 1925 and the end of 1929 (Snyder 1930, Table 1). In fact, pyramiding is the only possible explanation for the lack of evidence of the increases in broker loans affecting deposits at New York banks (Figure 11, See also Hoover 1929, 175).

### **Figure 11: New York Demand Deposits**

There is a line of argument in the literature that dismisses the quantum of brokers' loans as being an unstable influence, as loans as a percentage of market capitalization did not vary much in the late 1920s. As was pointed out at the time, however, price gains in the market would not in itself drive more lending (Eiteman 1932). To maintain a constant leverage, more credit is needed, and that credit was limited in the banking sector. Pyramiding was the only possibility for greater funding without uneconomic increases in rates.

### **Shadow banking and financial fragility**

By borrowing in the short term credit market outside of the regulated banking sector to buy long-term securities, more than one third of the investors on the NYSE of 1928-9 acted as shadow bankers, always at risk of a run on their loans at the least sign of trouble, forcing the borrowers to unwind all at once if the inevitable occurred. Indeed, crises such as the GFC of 2008-9 often result from a build-up of ultra-safe assets funding long-term investments with mark-to-market collateral triggers, and in turn renders the underlying market significantly more fragile (Pozsar et al 2010; Gorton and Metrick 2012). Evidence of a fragile credit market in 1929 would include (1) a highly leveraged market without participation from the traditional banking sector, (2) short-term lending collateralized by long term assets, and (3) ultra-safe “low information” investment products (Dang, Gorton, and Holmström, 2010). This perfectly describes the brokers’ loan market in 1929.<sup>5</sup>

Being secured by assets that are continuously marked to market, any over-accumulation of such credit puts the entire underlying asset market in jeopardy if the market value of the underlying assets falls. Funding withdrawals create selling pressure, cascading until the loans have been fully repaid. Many commentators lament that the fragilities inherent in maturity and mark-to-market mismatches, when stretched to their limit and hit a trigger point, require government rescue to protect the entire financial system from contagion (Adrian and Shin 2009; Gorton and Metrick 2012). Lenders of last resort and governments use public funds for bailouts and socialize losses—effectively substituting their “public” credit for the previous private credit, while the shadow bankers keep their profits earned before the crises.

There were many instances where corporate pull-back from the call loan market created instabilities that required bank intervention, including in mid-1928, when corporations withdrew funding to pay dividends. By 1929, the market was more dependent than ever on the non-banks, backstopped by the NY banks who were in turn to be backstopped by the Fed (Strong papers 1927-9, 9). There was mild panic in March, brought under control by the promise of intervention by the regulated banking sector (*New York Herald-Tribune*, 27 March 1929), followed by the Crash in late October. At this latter point, even though it could not control the build-up of credit, the Fed bailed out the system, assuming billions of loans (private credit) previously made on the NYSE by non-banks.

All of the ingredients of a shadow banking crisis were present in 1929, including a laissez faire attitude to both self and macro-prudential regulation. The NYSE membership did not want to kill off the golden goose of credit, and there was little support for intervention by the Fed in the stock market. Attempts by the Fed to

---

<sup>5</sup> The safety of the brokers’ loan market allowed lenders to be free from diligencing the borrowers (compared to a corporate loan or even an uninsured bank deposit), and opened the market to anyone with excess liquidity; creating a homogeneous market.<sup>5</sup> The non-bank brokers’ loan market therefore conformed to Mehrling’s model of shadow banking in that it was (1) free from regulation, (2) short-term by design, (3) easy to use; (4) ultra-safe; and (4) collateralized by long term assets that were marked to market at least daily.

wear the market off of credit were regularly stymied, exemplified by the defiance of the Fed by NY banks who injected credit into a panicked market in March. Rational actors engaged in a highly-profitable arbitrage that created a pro-cyclical feedback loop of ever-increasing low-powered money (mostly) outside of the banking system. Ultra-safe lending appears to be a condition precedent for shadow banking, and such lending on the NYSE exploded in the run-up to the Crash. The high and contingent leverage offered through shadow banking has the potential to cause the market for the underlying assets being financed to become extremely fragile. Shadow bank lending is generally also pro-cyclical in the extreme. Lending expands as asset prices rise. Private credit is created outside of the banking system, with no outside constraints. As long as the promised (or expected) asset return is higher than the costs of financing, borrowing appears rational (Adrian and Shin 2009). Small changes in perceptions, however, can lead to a chain reaction, or vicious circle, of selling to cover maturing and unrenewed liabilities, otherwise known as a “run”. In a run, assets are sold quickly, and usually at a discount, which can then trigger more asset liquidation as more borrowers become forced sellers. “This provides incentives to withdraw funding—before other shadow banking depositors arrive.” (Adrian, Ashcraft, and Cetorelli 2013, 13). The pyramiding of loans caused instabilities in underlying asset markets, instabilities that could only be resolved, absent a concerted regulatory effort, by a sharp downward correction accompanied by a deleveraging. Kindleberger (1978; 113) suggests it is less important to identify exactly what caused the Crash than to isolate the imbalances during the boom that led to a situation where “almost anything can collapse it”. He is uncertain that the brokers’ loan market was a direct cause of the October 1929 retreat in stock prices, even as he and others are sure that the bubble was caused by this easy credit, as well as other arbitrages, such as the investment trust pyramid (Kindleberger 1978; 136). Given the instabilities documented herein, it is difficult to see how 1929 could have happened in another way than it did.

Stock market investors borrowing on margin in the 1920s were invested in long-term, marked-to-market assets that were used as security for the lenders, similar to SIVs that used commercial paper to fund investments in long-dated subprime mortgage backed securities (2008), or the repo funding of long-dated U.S. government-guaranteed mortgage bonds that waived in 2019 and failed again in 2020 (Sengupta and Xue 2020). As one of the few shadow banking crises, lessons from 1928-9 may be useful in avoiding future catastrophes.

A final controversy to lay to the rest is that it was the exit of lenders from the call loan market in October of 1929 that caused the Crash. The key evidence against such an assertion is that rates did not rise during the crisis days in October, even as more than a billion dollars of credit was repaid and another billion was effectively backstopped by NY Fed member banks. If it was a supply shock, rates should have risen, as they did in 1907 (Fohlin 2018), yet did not. In fact, rates fell in early October and remained low from 10 percent at the end of September to 5 percent on Black Thursday, even as lending volumes increased. Contemporary

media report a calm unwinding of brokers' loans, resulting primarily from a decline in demand, over the Crash that began on "Black Thursday". Through that period, the report in the New York Times (23 October 1929 to 29 October 1929) reveal that "offerings of money were in excess of demand", "there was always enough [call money] to meet demand" and "interest of borrowers was... at a low ebb". The renewal rate on call loans reportedly did not budge at all over the five days of the Crash.<sup>6</sup> Both the levels of rates and the historical archive suggest that factors other than a credit contraction were behind the selling and that a fall in speculative credit was likely a result of deleveraging due to either a lack of capital to maintain the borrowing at previous levels, or a complete capitulation by leveraged investors, or both.

### **Fed ineffectiveness rather than incompetence or apathy**

The Fed has been blamed for its incompetence in first not leaning against the bubble enough in 1928 and then for not easing enough in 1929. Accusations rest on the assumption that the Fed could have influenced the market. It is not at all clear, however, that the Fed could have influenced the lending fueling the stock market rise. Certainly, it is very possible that monetary policy has no effect in managing asset bubbles. To the extent that such management is warranted, it may further be the case that monetary policy—the only tool available to the Fed in 1929—may not only be ineffective but might actually exacerbate a bubble (Gali 2014; Allen et al 2017). Even if the Fed should have been expected to temper speculative tendencies, this study provides evidence that Fed was not capable of having an influence on the U.S. stock market. The Fed of the time had few tools and little knowledge on how to best apply them (Meltzer 2003). The Fed could alter the required reserve ratio, move the rediscount rate, use direct action or conduct open market purchases/sales.

Direct action was used rather successfully at times, and bank lending on the NYSE fell slightly over the late 1920s. Unlike in Germany, however (Voth 2003), the market did not respond to moral suasion with a correction, likely because the majority of lending was untouched and untouchable by the Fed. This is because the small reduction in bank lending on the NYSE was more than offset by the arbitrage-driven increase in non-bank funding. As the 1928-9 growth of the brokers' loan market occurred almost entirely outside the banking system, deposits in New York did not rise, and reserves were not set aside. Increasing Fed member banks' reserve ratios, even if the Fed understood the appropriate mechanism, therefore could have had at most a small effect on overall speculative lending. Open market purchases, likewise, could only affect the supply of credit in the banking system.

Could the discount rate have had an effect? Friedman and Schwartz (1963) admit that discount rate rises

---

<sup>6</sup> By 29 October, the NY banks, backed by the Fed, had stepped into calm money markets even further by supporting the stock market directly in some cases and lending freely in the brokers' loan market. But rates were calm as liquidations drove prices lower on the previous two crash days of Black Thursday (24th) and Black Monday (28<sup>th</sup>).

could have been very damaging to the real economy, given the already deflationary and tight money environment. Even so, a rate rise could not have affected the brokers' loan market. When the NY Fed raised the rediscount rate in 1928 and in 1929, all rates reacted except for the those in the brokers' loan market. This is likely because the arbitrage that fuelled the self-sustaining uncontrollable pyramiding of private credit was dependent only on the difference between the demand-driven brokers' loan rates and the borrowing and capital costs of corporations and trusts. It is therefore hard to fault the Fed for not "leaning against the wind".

It is both unclear that raising rates can prick any asset bubble (Gali 2014; Allen et al 2017) and that raising rates could have popped the 1928-9 bubble without affecting the real economy. Rates likely would need to have been raised above the call loan rate—or at least above the time loan rate—for the Fed to have siphoned away any credit from the NYSE. But such a move would not have eliminated the arbitrage: Brokers' loans rates would likely remained above this towering discount rate, and the costs of corporate debt or equity would probably not have risen above the new costs to speculators. Only second-order effects could have operated on the call loan market, by slowing the economy or eliminating the arbitrage by affecting long term rates or business prospects (herby decreasing prices in the stock and bond markets). Yet any such moves would have resulted in a deeper credit contraction than was already underway. Even Freidman & Schwartz admit that the economy that was turning in 1929 with recent deflation could not have coped, and indeed did not cope well, with higher rates.

If anything, the somewhat contractionary policy of the Fed in 1928-9 had the potential to fuel private credit growth, as is predicted by Nelson et al (2015). Indeed, the theory and empirical evidence of other crises concludes that monetary policy is less effective than macro-prudential policy for ensuring the required stability in capital markets (Adrian et al 2018). Theoretically, monetary policy would be less effective when investment in the long-term asset was still rational at higher funding rates, as was the case in 1929. If rates no longer were related, it is hard to imagine how any Fed rate actions would have curtailed the brokers' loan market. It therefore seems unlikely that the Fed could have influenced the growth of non-bank speculative lending. It may have been possible to raise rates enough to alter expectations of NYSE investors, but this would have definitely affected the real economy at the same time.

It is likely that only a revision of future stock market return expectations, a rise in long-term borrowing rates as compared to brokers' loan rates, or macro-prudential regulation could have stopped the build-up of the speculative credit imbalance. If the non-banks would have been forbidden from participating in securities loans, or if the arbitrage had not existed, the inelastic nature of the supply curve for banks would have naturally put a ceiling on demand through the call loan rate, as happened in the past. Effectively, large corporations were acting like banks without being regulated like them, and households were behaving as

shadow bankers, yet without access to the lender of last resort. The Fed could not have directly influenced long-term bond rates. “Operation twists” were beyond the understanding and power of the 1929 Fed. That leaves macro-prudential control, effectively banning or severely limiting non-banks from entering the brokers’ loan market. Without funds provided by shadow banking, the Fed’s policy to limit member bank loans to brokers through direct action would likely have caused rates to rise enough to choke off speculative borrowing, as had occurred prior to the major influx in funding by others in 1927-8. If the brokers’ loan market behaved in 1929 as it had in 1927, reliant on the banking system for credit, rediscount rate hikes may also have exerted earlier pressure on the stock market. Correlation would not have been lost. But the pyramiding in the shadow banking market allowed rates to normalize and decouple from those the Fed could directly influence, even as borrowing doubled.

Most of the lending on the NYSE—the non-bank “bootleg loans—originated outside of the banking system, lacking access to the Fed discount window and outside the supervision of the Comptroller of the Currency, the Treasury and the Fed (see Figure 1 for the non-bank participation levels). As the market functioned mostly outside of the banking system and was no longer correlated to other money markets, it was beyond the control of the Fed, a fact that many of the Board members and Reserve Bank leaders acknowledged at the time (Meltzer 2003, 209, 213-4). The Fed can therefore not be blamed for inaction as regards the brokers’ loan market and the bubble and crash of 1929.

## **Conclusions**

The brokers’ loan market as measured by both rates and volumes rose in spite of attempts to control it by the Federal Reserve system through direct action. Demand for speculative credit caused borrowing costs on the NSYE to rise high enough to attract new lenders who took advantage of a risk-free arbitrage. Rates, however, did not rise high enough to choke off borrowing demand, as new arbitrage-driven supply from corporates alleviated the credit shortage and thereby dampened the cost of borrowing.

The traditional relationship between bank credit supply and cost had broken down in the brokers’ loan market by the middle of 1928. The relationship between borrowers and lenders created a pro-cyclical pyramiding of private credit. Importantly, supply created its own demand. And, for a time, this was both rational and profitable. As a result, the brokers’ loan market decoupled from other money markets, including those under the influence of the Fed. The key variable influencing loan supply was the spread between long term corporate borrowing rates and the call loan rate. It was not in the Fed’s purview or ability to influence that rate, and therefore it had not control over non-bank lending using its primitive monetary policy tools.

The rise of the bootleg brokers’ loan market provides more evidence that attempts to fix the amount of money and credit in a system can be futile if not properly implemented. The government and the Fed fixed

the amount of currency and limited bank credit to both the real economy and margin lending, yet the private sector provided the unprecedented amount of credit demanded by speculators. On its own this is not a concern. It is when these private actions affect the entire financial system. However, history has shown—in 1929 as in 2008 and 2020—that shadow banking markets are not only very unstable but can contaminate other markets. As a call loan is an ultra-safe asset (Saleuddin 2020), there is no limit to how much money can enter the shadow banking system. Margin lending is therefore often a worry to modern policymakers. During the 2015 peak in Chinese markets, such loans accounted for 10 percent of market capitalization, up from low single-digits previously (Hale 2020). More generally, shadow banking, in the form of off-balance sheet borrowing and lending referencing U. S. subprime mortgage-backed securities, was a significant cause of the Global Financial Crisis in 2008-9, while extensive repo funding and daily liquidity in funds holding otherwise illiquid assets justifies at least in part the Fed and Treasury bailouts of 2020 (Gorton and Metrick 2012; Chang et al 2020).<sup>7</sup> After two shadow banking crises this century—the Global Financial Crisis of 2008-9 and the “Great Cessation” beginning in 2020—understanding the role of shadow banking in developing instabilities and causing or exacerbating crises, as well as the roles of lenders of last resort, regulators and the financial industry in such situations, are crucial to avoid similar future events.

In the end, the bootleg loans problem disappeared on its own. Corporations and others no longer had surplus cash, and investors saw no reason to add to the risk of investing in the uncertain equity markets of the 1930s by borrowing on their securities holdings. Without unilateral action by the shadow bankers, others were powerless to stop the influx of capital onto the NYSE before the Crash. The Fed likely did not have the tools or the mandate to control or even supervise the market. The industry itself wanted to keep the speculative fires burning through leverage. In March 1929, the bankers unilaterally intervened despite Fed direct action to rescue a falling credit-rationed market and reassured the market it would do it again. The self-regulatory agency, the NYSE at this point, did nothing until after the Crash. In hindsight the simple act of restricting non-bank access—as the NYSE did in early 1931—was all that was needed (*New York Times* November 6 1931). Yet political and industry pressures precluded such a response. Government intervention in the form of Regulation T in 1933 arrived well after other responses and was limited to establishing minimum margins at slightly higher levels than they had been in September 1929. Such levels would not have affected speculative lending in 1928-9.

One possible lesson to be learned from this period in shadow banking history is that macroprudential

---

<sup>7</sup> “Repo” is short for sale and repurchase agreement, where a lender provides cash and takes possession of collateral with a market value of more than the initial loan. At the end of the contract, overnight in many cases, the borrower repays the funds and takes back the collateral securities. It is currently a multi-trillion dollar industry. Though the 2020 liquidity crisis did not originate in the banking sector, short term U. S. dollar credit markets nevertheless required a complete bailout by the Fed, with guarantees by the Treasury. See <https://www.federalreserve.gov/newsevents/funding-credit-liquidity-and-loan-facilities.htm> for more on the 2020 U. S. Fed and Treasury bailout.

regulation cannot easily be replaced by central bank discount rate intervention, while industry self-regulation cannot be relied upon for restraint. A focus on the Fed's inaction using the discount rate in 1929 may have the tendency to absolve future regulatory forces from acting in a prudent manner.

## References

- Adrian, Tobias, and Hyun Song Shin. "The shadow banking system: implications for financial regulation." FRB of New York Staff Report No. 382 (2009).
- Adrian, Tobias, Adam B. Ashcraft, and Nicola Cetorelli. "Shadow bank monitoring." FRB of New York Staff Report No. 638 (2013).
- Adrian, Tobias, Giovanni Dell'Ariccia, Vikram Haksar, and Tommaso Mancini-Griffoli. "Monetary policy and financial stability." In *Advancing the Frontiers of Monetary Policy*. International Monetary Fund, 2018.
- Allen, Franklin, Gadi Barlevy, and Douglas M. Gale. "On interest rate policy and asset bubbles." SSRN (2017).
- Bai, Jushan, and Pierre Perron. "Critical values for multiple structural change tests." *The Econometrics Journal* 6, no. 1 (2003): 72-78.
- Bogen, Jules Irwin, and Herman Edward Krooss. *Security Credit: Its Economic Role and Regulation*. Prentice-Hall, 1960.
- Braggion, Fabio, Rik Frehen, and Emiel Jerphanion. "Does credit affect stock trading? Evidence from the South Sea Bubble." SSRN (2020).
- Bruner, Robert F., and Scott C. Miller. "The great crash of 1929: A look back after 90 years." *Journal of Applied Corporate Finance* 31, no. 4 (2019): 43-58.
- Brunnermeier, Markus K., and Martin Oehmke. "Bubbles, financial crises, and systemic risk." In *Handbook of the Economics of Finance*, vol. 2, pp. 1221-1288. Elsevier, 2013.
- Brunnermeier, Markus K., and Lasse Heje Pedersen. "Market liquidity and funding liquidity." *The Review of Financial Studies* 22, no. 6 (2009): 2201-2238.
- Cheng, Jeffery, David Wessel and Joshua Younger. "How did COVID-19 disrupt the market for U.S. Treasury debt?". Brookings 2020.
- Dang, Tri Vi, Gary Gorton, and Bengt Holmström. "Financial crises and the optimality of debt for liquidity provision." Unpublished working paper. Yale School of Management (2010).
- De Long, J. Bradford, and Andrei Shleifer. 1991. "The stock market bubble of 1929: Evidence from closed-end mutual funds." *Journal of Economic History*: 675-700
- Di Maggio, Marco, and Amir Kermani. "Credit-induced boom and bust." *The Review of Financial Studies* 30, no. 11 (2017): 3711-3758.

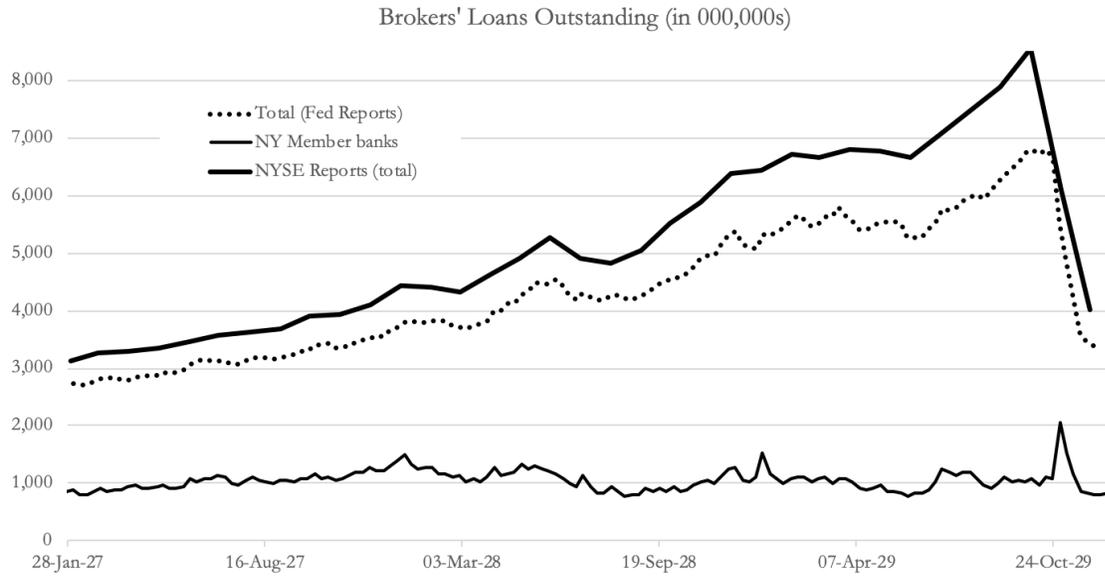
- Eichengreen, Barry. *Hall of Mirrors: The Great Depression, the Great Recession, and the Uses-and Misuses-of History*. Oxford: Oxford University Press, 2015.
- Eiteman, Wilford J. "The economic significance of brokers' loans." *Journal of Political Economy* 40, no. 5 (1932): 677-690.
- Fisher, Irving. *The Stock Market Crash—and After*. New York: The Macmillan Co, 1930.
- Fohlin, Caroline. "The volatility of money: The New York call money market and monetary policy regime change." (2018).
- Fortune, Peter. "Margin requirements, margin loans, and margin rates: Practice and principles." *New England Economic Review* (2000): 19-44.
- Fortune, Peter. "Margin lending and stock market volatility." *New England Economic Review* (2001): 3-26.
- Friedman, Milton and Anna Schwartz. *A Monetary History of the United States, 1867-1960*. Princeton: Princeton University Press, 1963.
- Friedman, Milton. "The optimum quantity of money and other essays." Chicago: Aldine, 1969.
- Friedman, Milton. "Abolish the Fed". <https://www.youtube.com/watch?v=m6fkdagNriI>
- Galbraith, John. *The Great Crash of 1929*. New York: Mariner Books, 2007 (1954).
- Gali, Jordi. "Monetary policy and rational asset price bubbles." *American Economic Review* 104(3) (2014): 721-52.
- Gorton, Gary, and Andrew Metrick. "Securitized banking and the run on repo." *Journal of Financial Economics* 104, no. 3 (2012): 425-451.
- Gorton, Gary, and George Pennacchi. "Financial intermediaries and liquidity creation." *The Journal of Finance* 45, no. 1 (1990): 49-71.
- Hale, Thomas. "Rise in margin lending stokes fears of China bubble". *Financial Times*, 8 July 2020.
- Harris, Seymour Edwin. *Twenty Years of Federal Reserve Policy Vol. II: The Monetary Crisis*. Harvard University Press, Cambridge, 1933.
- Hoover, Calvin B. "Brokers' loans and bank deposits." *Journal of Political Economy* 37, no. 6 (Dec. 1929): 713-727.
- Keynes, John Maynard. *The General Theory of Employment, Interest, and Money*. Springer, 2018 (1935).
- Kindleberger, Charles P., and Robert Z. Aliber. *Manias Panics and Crashes*. Palgrave, 2011 (1978).
- McGrattan, Ellen R., and Edward C. Prescott. "The 1929 stock market: Irving Fisher was right." *International Economic Review* 45, no. 4 (2004): 991-1009.

- Meeker, James Edward. *The Work of the Stock Exchange*. Ronald Press Company, 1922.
- Mehrling, Perry. *The New Lombard Street: How the Fed Became the Dealer of Last Resort*. Princeton: Princeton University Press, 2010.
- Mehrling, Perry. “Three principles for market-based credit regulation.” *American Economic Review* 102, no. 3 (2012): 107-12.
- Mehrling, Perry, Zoltan Pozsar, James Sweeney, and Dan Neilson. “Bagehot was a shadow banker.” *Shadow Banking within and across National Borders*. London: World Scientific (2015): 81-98.
- Minsky, Hyman P. “Financial crises: Systemic or idiosyncratic.” (1991).
- Nelson, Benjamin, Gabor Pinter and Konstantinos Theodoris. “Do contractionary monetary policy shocks expand shadow banking?” *Bank of England Staff Working Paper 521* (2015).
- Pozsar, Zoltan, Tobias Adrian, Adam Ashcraft, and Hayley Boesky. “Shadow banking.” No. 458. Federal Reserve Bank of New York, 2010.
- Pozsar, Zoltan, and Manmohan Singh. “The nonbank-bank nexus and the shadow banking system.” *IMF Working Papers* (2011): 1-18.
- Quinn, William and John D. Turner. *Boom and Bust: A Global History of Financial Bubbles*. Cambridge: Cambridge University Press, 2020).
- Rappoport, Peter, and Eugene N. White. “Was there a bubble in the 1929 stock market?” *The Journal of Economic History* 53, no. 3 (1993): 549-574.
- Rappoport, Peter, and Eugene N. White. “Was the crash of 1929 expected?” *The American Economic Review* 84, no. 1 (1994): 271-281.
- Reuters, “Once bitten, not shy: Investors again seek margin loans as stocks rally.” 9 June 2020.
- Roelse, Harold V. “Security loans in recent years.” *The Review of Economics and Statistics* 12, no. 3 (1930): 109-11.
- Saleuddin, Rasheed. *Regulating Securitized Products: a Post Crisis Guide*. Springer, 2015.
- Saleuddin, Rasheed. “Revisiting the 1928-9 stock market ‘bubble’.” SSRN (2020).
- Shiller, Robert J. *Irrational Exuberance*. Princeton, 2000.
- Shleifer, Andrei, and Robert Vishny. “Fire sales in finance and macroeconomics.” *Journal of Economic Perspectives* 25, no. 1 (2011): 29-48.
- Smiley, Gene, and Richard H. Keehn. “Margin purchases, brokers’ loans and the bull market of the twenties.” *Business and Economic History* (1988): 129-142.
- Snyder, Carl. “Brokers’ loans and the pyramiding of credit.” *Journal of the American Statistical Association* 25, no.

- 169A (1930): 88-92.
- Sobel, Robert. *The Big Board: A History of the New York Stock Market*. New York: The Free Press, 1965.
- Strong papers, 1927-9. FRASER.
- Taylor, John B. "Discretion versus policy rules in practice." Carnegie-Rochester Conference Series on Public Policy 39 (1993): 195–214.
- U.S. Federal Reserve Act, 1913. Pub. L. 63-43, ch. 6, 38 Stat. 251 (1913).
- U. S. Federal Reserve, 1914-1941 Money and Banking Statistics, 1943.
- U. S. Senate Committee on Banking and Currency, Stock Exchange Practices, Report No. 1455 pursuant to Senate Resolutions 84 (72d Congress), 56 and 97 (73d Congress), 73d Congress, 2d Session (Washington: USGPO, June 6, 1934).
- Voth, Hans-Joachim. "With a bang, not a whimper: Pricking Germany's 'stock market bubble' in 1927 and the slide into depression." *Journal of Economic History* 63, no. 1 (2003): 65-99.
- Waxman, Olivia. "What caused the stock market crash of 1929." *Time Magazine* (24 October 2019). <https://time.com/5707876/1929-wall-street-crash/>
- White, Eugene N. "The stock market boom and crash of 1929 revisited." *Journal of Economic Perspectives* 4, no. 2 (1990): 67-83.
- White, Eugene N. "The fundamental things apply: How to face up to asset market bubbles." *Financial Market History* (2016).
- White, Laurence. "Should we end the Fed." [https://www.youtube.com/watch?v=a\\_s6ofhyqWw](https://www.youtube.com/watch?v=a_s6ofhyqWw)

## Figures and Tables

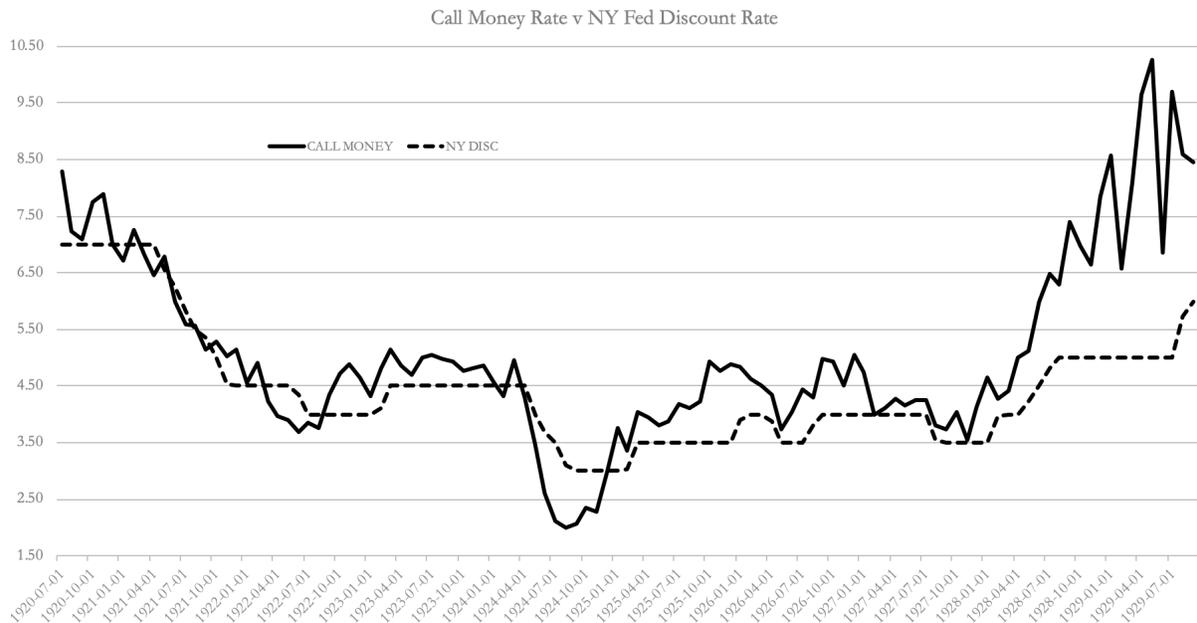
**Figure 1**



Source: U. S. Federal Reserve, 1914-1941 Money and Banking Statistics, 1943, Table 141. *New York Times*.

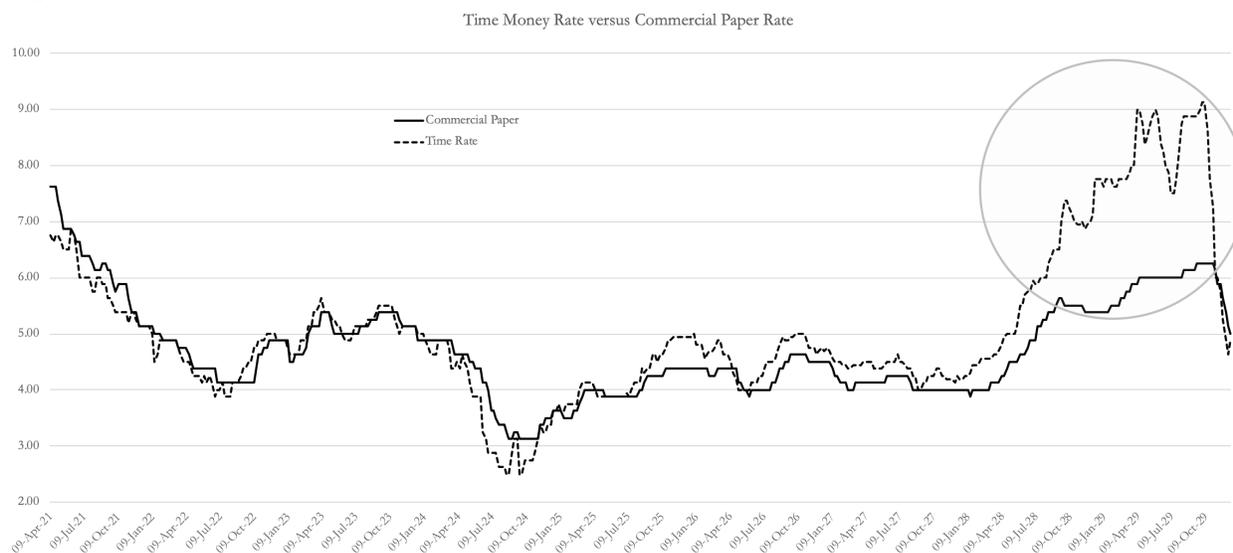
Notes – NYSE reports are monthly.

**Figure 2**



Source: FRASER, FRED.

**Figure 3**



Source: U. S. Federal Reserve, 1914-1941 Money and Banking Statistics, 1943, Table 141. *New York Times*.

**Table 1: 1926-Oct 1929 key variables summary table (147 weekly observations overlap)**

	Brokers' Loans ("Others", \$ millions)	Brokers' Loans (Total, \$ millions)	Commercial Paper (%)	Bankers' Acceptances (%)	Time Loan Rate (%)	Call Loan Rate (%)	NY Fed Discount Rate (%)	New Issues (6 month MA, \$ millions)	Dow Jones Industrial Average (Points)
Mean	1787.48	4328.82	4.89	4.19	6.02	6.03	4.47	2811.98	237.66
Standard Error	77.54	95.27	0.07	0.06	0.14	0.18	0.06	78.93	5.37
Median	1642.00	4223.00	4.63	4	5.5	5.63	4.5	2377.5	212.46
Standard Deviation	940.11	1155.10	0.83	0.78	1.74	2.18	0.73	956.92	65.07
Kurtosis	-0.93	-1.04	-1.58	-1.32	-1.43	0.63	-0.71	-0.66	-1.06
Skewness	0.59	0.34	0.28	0.32	0.43	0.96	0.35	0.97	0.55
Range	3220.00	4085.00	2.37	2.43	5.13	10.90	2.50	3423.49	226.25
Minimum	721.00	2719.00	3.88	3.13	4	3.5	3.5	1546.25	153.36
Maximum	3941.00	6804.00	6.25	5.56	9.13	14.40	6.00	4969.74	379.61
Count	199	199	199	199	199	199	199	199	199

**Table 2: 1926-1931 correlation matrix**

	BL "Others"	BL, Total	CP	Acc	Time	Call	NY Fed	New Issues (6moMA)	DJIA
BLOthers	1								
BLTotal	0.9792	1							
CP	0.9611	0.9187	1						
Acc	0.9287	0.8760	0.9672	1					
60dBroker	0.9677	0.9325	0.9784	0.9617	1				
Call	0.8203	0.8116	0.8593	0.8606	0.8575	1			
NY Fed	0.9186	0.8751	0.9407	0.8968	0.9218	0.7709	1		
NI (6moMA)	0.9025	0.8591	0.8307	0.8644	0.8628	0.7306	0.7452	1	
DJIA	0.9676	0.9723	0.9199	0.8857	0.9417	0.8155	0.8503	0.8803	1

**Table 3: Regression and Bai-Perron tests for structural breaks**

Breaks (Bai Perron)	<u>Time Money Rate</u>		<u>Call Money Rate</u>	
	Weeks 42, 139, 168		Weeks 169	
	October 1926, September 1928, March 1929		April 1929	
Regression of the time and call money rate on the 90-day bankers' acceptance rate and the volume of brokers' loans by others (non-banks)				
<b>A. Regression to first Breakpoint</b>	to October 1926		to April 1929	
Intercept (Newey West SE)	-0.1461 (0.4448)	✓	-1.409 (0.7161)	✓
BA90 (Newey West SE)	<b>1.1335***</b> (0.1653)	✓	<b>1.4274***</b> (0.2382)	✓
BLOthers (Newey West SE)	0.0011* (0.0005)	✓	0.0009*** (0.0003)	✓
R Squared	0.901	✓	0.7894	
<b>B. Regression to Breakpoint 2</b>	to September 1928			
Intercept (Newey West SE)	0.3828 (0.3199)	✓		
BA90 (Newey West SE)	<b>0.9544***</b> (0.0867)	✓		
BLOthers (Newey West SE)	<b>0.0008***</b> (0.0001)	✓		
R Squared	0.9611			
<b>C. Regression to Breakpoint 3</b>	to March 1929			
Intercept (Newey West SE)	5.0245 (3.2777)	✓		
BA90 (Newey West SE)	0.0345 (1.1454)	✓		
BLOthers (Newey West SE)	0.0010 (0.0010)	✓		
R Squared	0.5338			
<b>D. Regression to October 1929</b>	to October 1929		from April 1929 to October 1929	
Intercept (Newey West SE)	0.4485 (4.864)	✓	18.329 (12.742)	✓
BA90 (Newey West SE)	<b>1.1429</b> (0.7406)	✓	<b>-0.3092</b> (2.1070)	✓
BLOthers (Newey West SE)	<b>0.0006</b> (0.0004)	✓	<b>-0.0025*</b> (0.0011)	✓
R Squared	0.0319		0.1494	

(1) Positive near-unity and significant relationships between the BA rate and the brokers' loan rate and (2) a significant and large (around a 1% point change in rate per \$1 billion) effect from additional non-bank brokers' loans are consistent with the conclusion that speculative loan markets are correlated with money markets to the extent that banks are major funders, yet speculative loan rates rise further when there is excess demand that needs to be met by

A complete breakdown relationships for both time and call money are consistent with the assertion that new supply entered such that (1) bank funding levels and (2) credit constraints on behalf of corporations became less important in determining brokers'

\*\*\* Significant at < 0.001, \*\* Significant at < 0.01, \* Significant at < 0.05.  
Source: U. S. Federal Reserve (1943, Table 121)

Figure 4

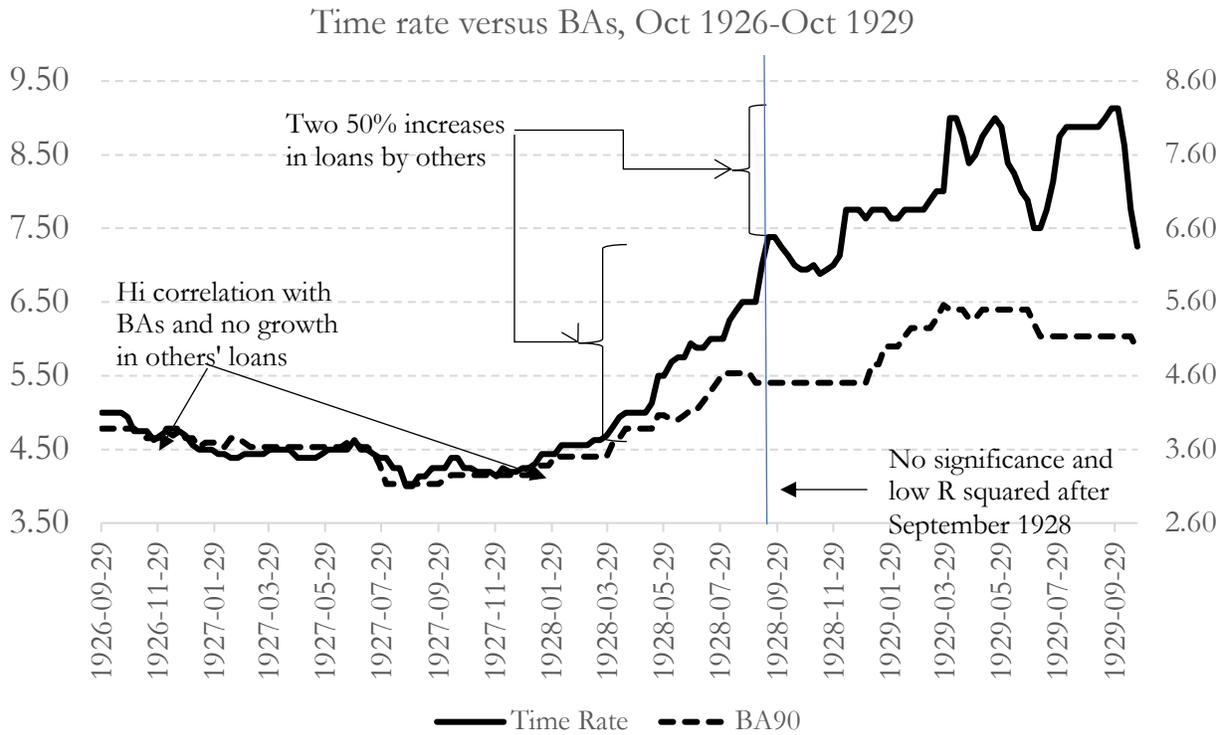
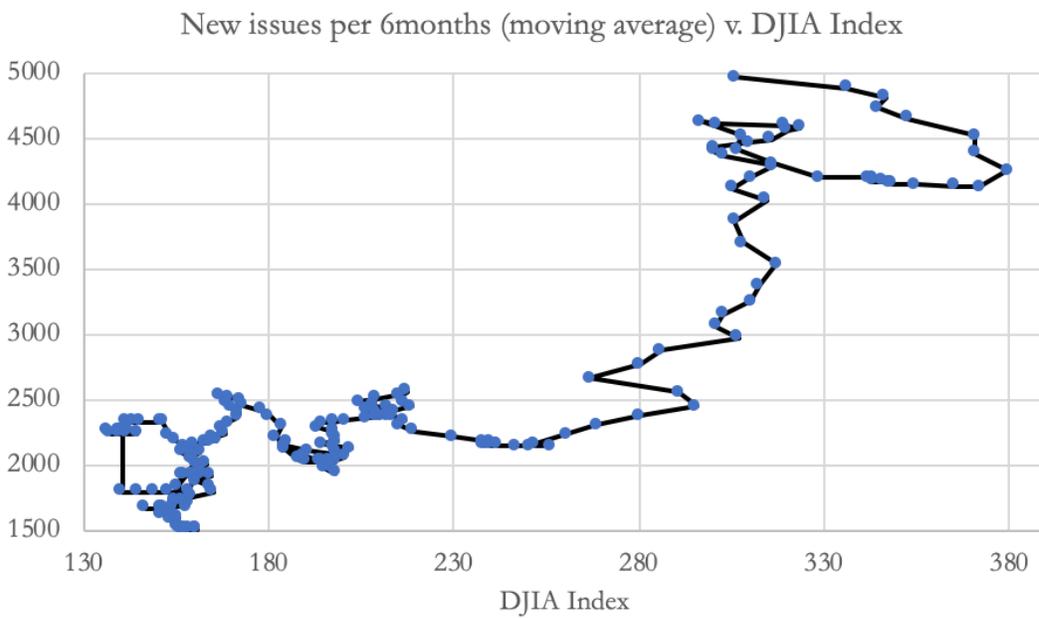
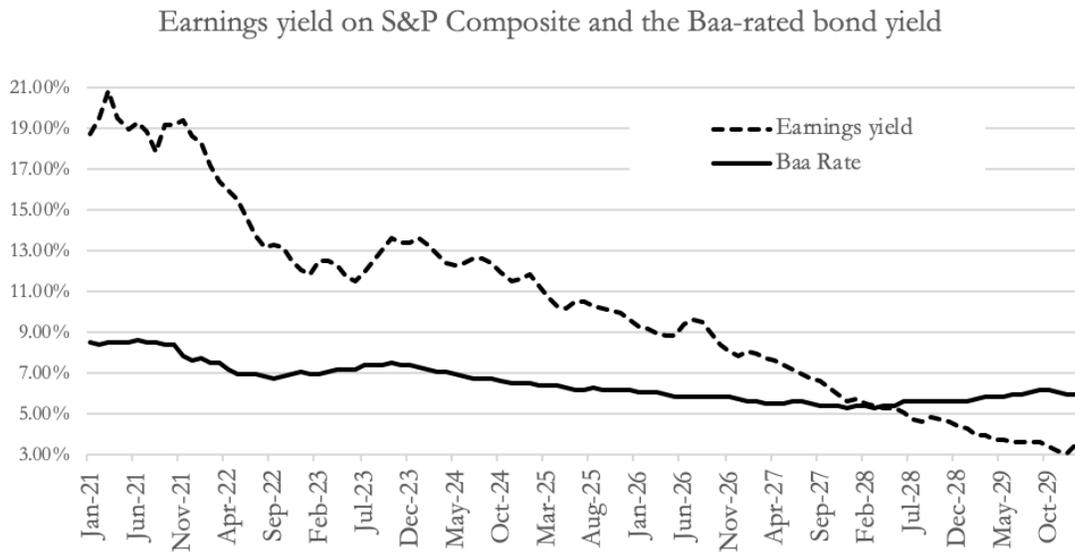


Figure 5

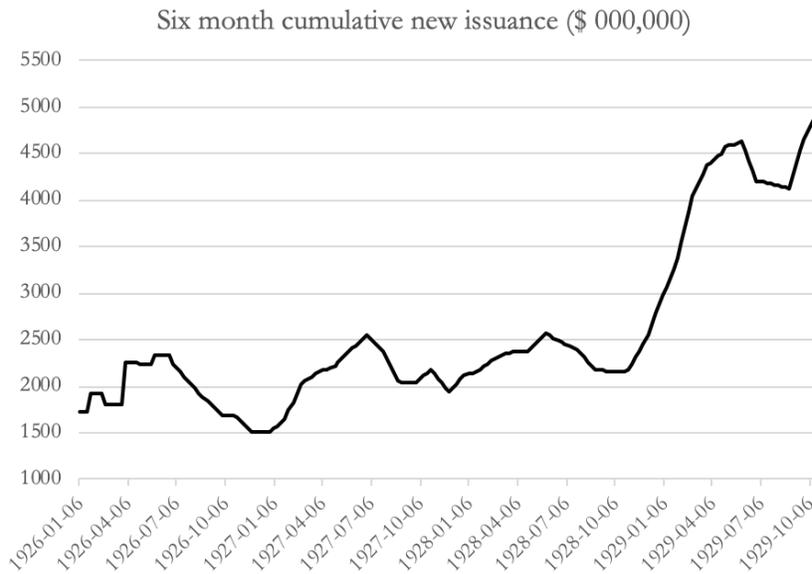


**Figure 6**



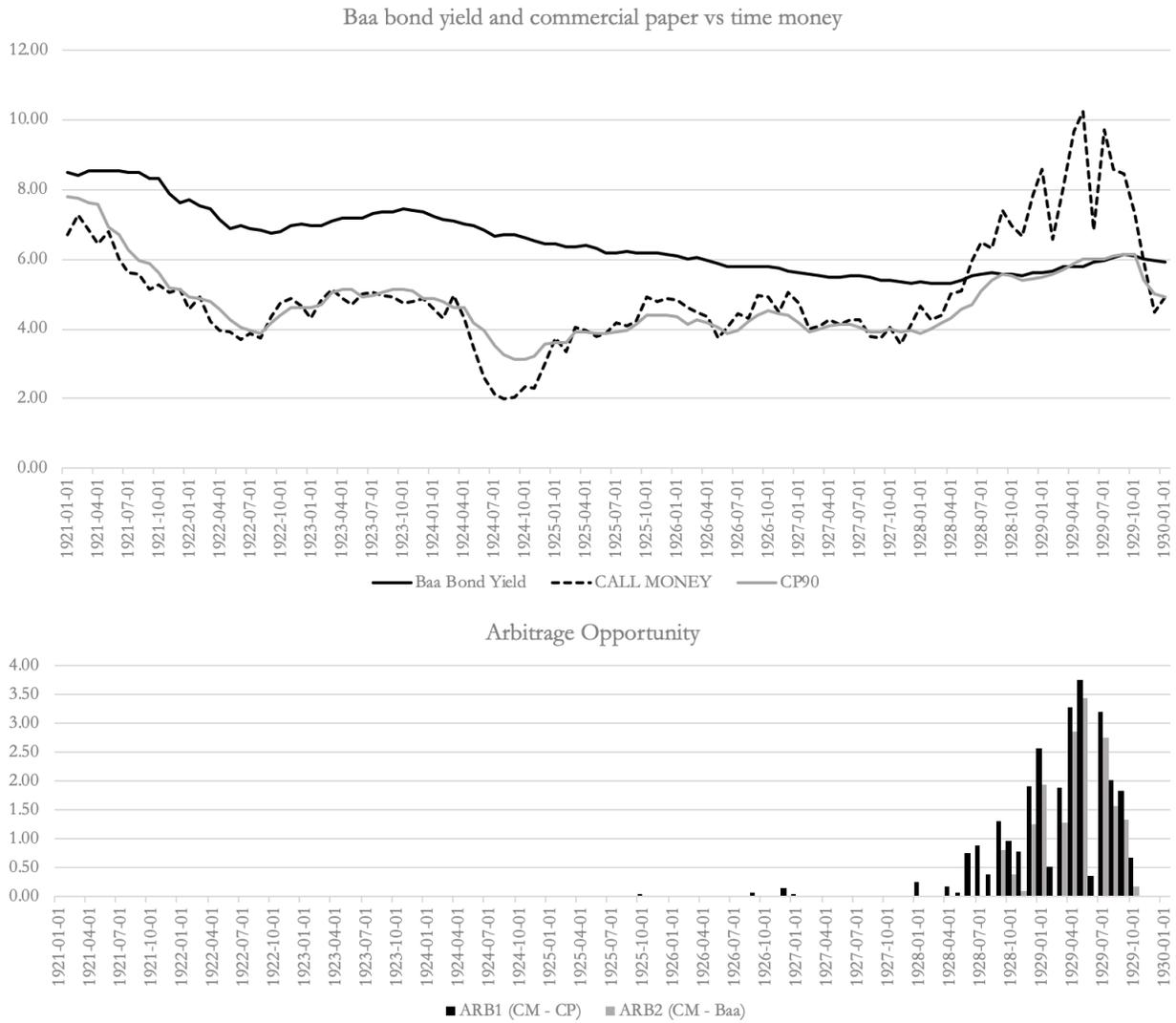
Source: Shiller (2000), FRED.

**Figure 7**



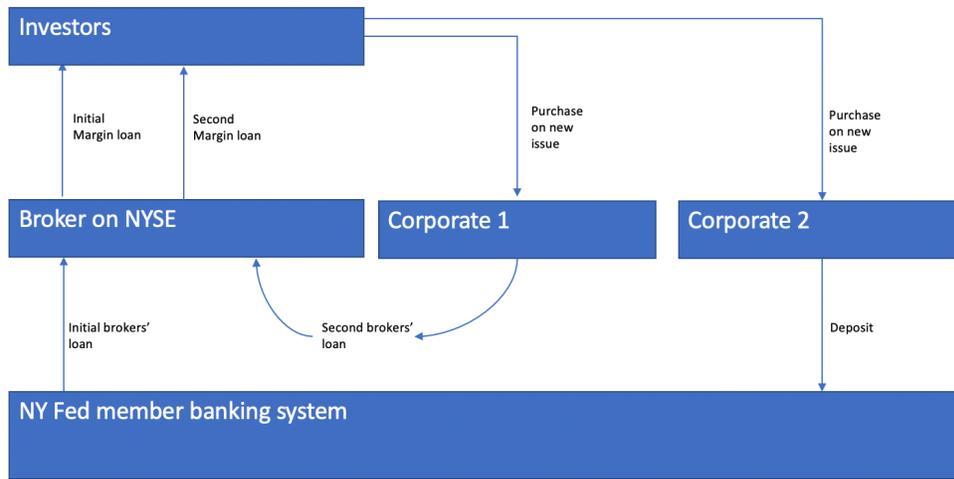
Source: New York Times, FRED

**Figure 8**



Source: ALFRED

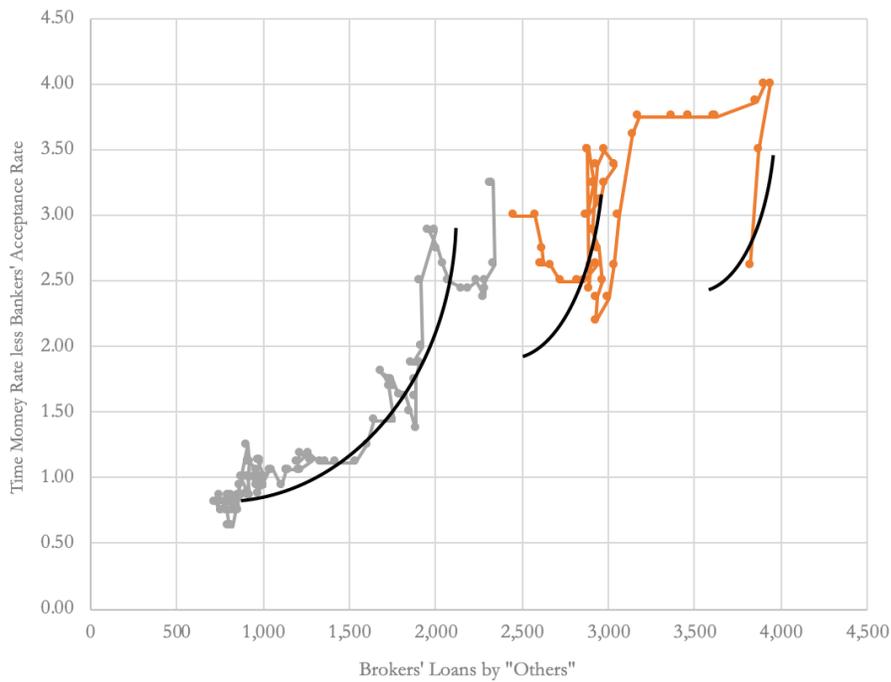
**Figure 9: Pyramiding credit**



Source: Eiteman 1932, 688. Author's own.

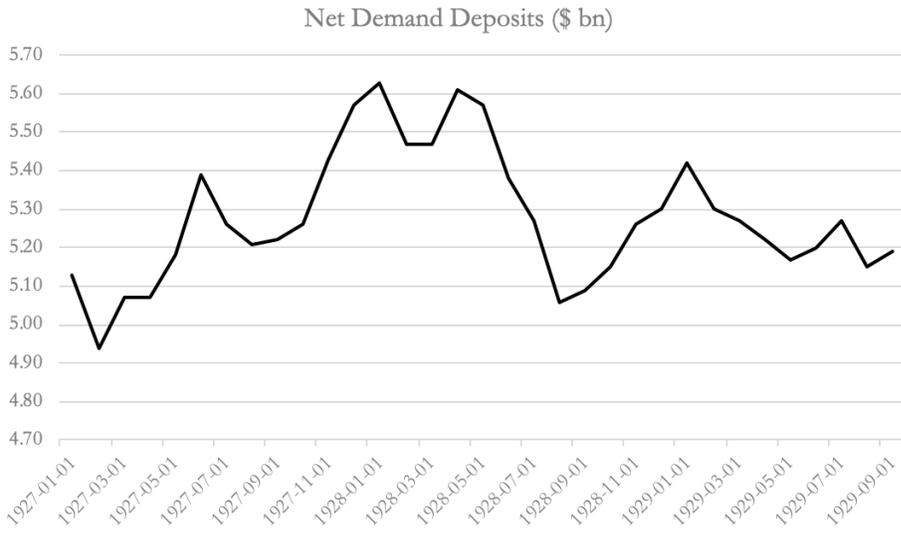
**Figure 10**

Time Spread v others' loans (May 1927 to Oct 1929)



Source: US Federal Reserve, 1914-1941 Money and Banking Statistics, 1943

**Figure 11**



Source – ALFRED.