

Repurchase agreements and the (de)construction of financial markets

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Abstract

The safety of repurchase agreements (repos) depends on the neoclassical premise that markets are reliable sources of liquidity; repos in practice disprove the theory by generating collateral calls, collateral sales, liquidity events, and liquidity-driven losses for repo-borrowing funds and their end investors. As repo-type lending now dominates money markets, borrowers' self-protective preference for 'safe assets' as collateral has distorted financial markets, disrupting private investment, and economic performance. Using a balance sheet approach this paper explains the liquidity-supporting role of the traditional banking system and contrasts it with the liquidity-demanding repo-based financial system. The paper also argues that contractual structure determines the balance of power in private sector loans, that no private loan is 'safe' for both borrower and lender, and that repo has shifted the balance of safety decisively in favour of lenders.

Keywords: repurchase agreements, safe assets, market liquidity, banking, liquidity crises, secular stagnation

Introduction

The fundamental problem of finance is this: even though debt plays an important role in production and growth, what constitutes 'safe' debt for a lender is precisely the opposite of what constitutes 'safe' debt for a borrower. Because the future is uncertain, safe borrowing requires debt that is long-term and unsecured. Lending by contrast is safe when debt is extremely short-term and grants the lender the immediate right to seize the borrower's assets as soon as there is any risk of default. The banking system offers a modicum of safety to both lenders and borrowers, not just by transforming the maturity of the debt, but more importantly by placing the burden of loss due to default on the bank owners, whose interests thus lie in making the system of maturity transformation work. By disintermediating banks the development of 'market-based' lending has transformed

the relationship between borrowers and lenders and has culminated in the growth of repurchase agreements (repos): Repos are a type of collateralized loan that gives lenders particularly strong contractual rights over borrower assets (Riles, 2011). This paper studies the consequences of this shift to a repo-based financial system and asks whether the traditional deposit-funded banking system provides better support for financial stability and performance than the ‘market-based’ system that has developed over the past few decades.

While the instability associated with repo markets is well established in the International Political Economy literature (Gabor, 2016; Gabor & Ban, 2016), this paper identifies contractual structure as both the foundation of the ‘safety’ that repo creates for the lender – at the expense of the repo borrower – and the source of instability. Drawing on earlier work explaining the role played by the traditional banking system in stabilizing and providing liquidity to the economy (Sissoko, 2016a; Sissoko, 2016b),¹ a balance sheet approach compares the traditional banking system to the modern ‘market-based’ financial system. I find that this transformation both fosters instability and also explains the excess demand for safe assets that is associated with lacklustre economic performance and secular stagnation.

Collateralized loans take many different forms – a mortgage loan is not the same as a repo. The problem studied in this paper is not the growth of collateralized lending *per se*, but the growth of repo-type collateralized loans.² In this paper the term ‘repo market’ will be used somewhat loosely to aggregate both repo and margin transactions. The latter have the same basic contractual structure as repo, but in a margin transaction collateral is posted to cover liabilities due on derivatives contracts or short positions (cf. Pozsar, 2015).

In a repo contractual structure creates safety for the lender: a threshold level of over-collateralization is set, and if it is not maintained the lender has the right to sell the collateral. Thus, given a \$1 million loan with a 110 per cent collateral threshold, a collateral call is issued when the collateral value falls below \$1.1 million. The call must be met within days or the collateral will be sold to pay off the loan with sales proceeds in excess of the \$1 million loan returned to the borrower. In short, due to contractual structure as long as over-collateralization is properly managed a repo is a genuinely safe asset independent of the riskiness of the collateral financed. On the other hand, if the market for collateral is illiquid and over-collateralization is insufficient, then a decline in price between the call and the sale of the collateral may mean that the lender does not recover the value of the loan. Market liquidity in turn depends on the absence of a coordinating device that will cause an imbalance between buyers and sellers on the market. At the same time, widespread use of repos creates just such a coordinating device: a decline in the price of collateral generates collateral calls and, when the calls are not met, collateral sales, and further declines in price. Furthermore, if future market illiquidity is anticipated, then a careful repo lender will demand more collateral against the loan by raising the over-collateralization threshold, increasing the likelihood that the call is not met, that collateral is sold, and that prices fall further.³

In the 1930s brokers' loans, comparable to repos, were widely viewed as having played an important role in the US stock market crash of 1929 (Smiley & Keehn, 1988), and US banks were struggling to perform their role as liquidity providers. Unsurprisingly, Keynes (1997 [1935]) explicitly discusses the instability of US markets, when he explains the ephemeral nature of market liquidity, observing 'there is no such thing as liquidity of investment for the community as a whole'. Building upon his insights I develop an asset price instability hypothesis that complements Minsky's famous hypothesis. Whereas the

latter characterizes any capitalist economy and instability builds up over time throughout the economy, my instability hypothesis is specific to a financial system that relies heavily on repo-type contracts. Instability can be triggered by the failure of a single financial market participant with a large balance sheet. Minsky's theory is, however, entirely consistent with this paper: because banking successfully stabilized financial markets – and their liquidity – the financial system evolved to rely so heavily on market liquidity that it is now 'designed' to cause liquidity to fail.⁴

Because repo markets are premised on the neoclassical model where markets themselves are a source of liquidity, repo markets have the effect of exposing a deconstruction of neoclassical economic theory. By treating neoclassical theory as a text and its approach to liquidity as a key concept that is constructed on a contradiction,⁵ we see that repos expose 'liquidity' as one of the fault lines of the neoclassical model.⁶ In short, the effect of taking the neoclassical model seriously by turning to repo for liquidity is to expose the flaws inherent in this conception of liquidity – or in other words to cause real world market liquidity to evaporate. The effect of repo markets on liquidity is well established in the literature: for Gabor (2016) this effect creates an 'impossible repo trinity', and Gabor and Vestergaard (2018) draw lessons from it for European repo market regulation. Bryan and Rafferty (2013) study this phenomenon, finding that the tools of modern finance are premised on liquid markets that since 2008 have failed. Saguato (2015), too, describes it and calls for repo market reform. Pitluck (2011) analyses a related phenomenon, establishing that illiquidity is a pervasive problem in US markets by studying the behaviour of asset managers.

Social Studies of Finance scholars view markets as 'neither essences nor pure constructions but as contingent outcomes of the way in which they are performed' (Cochoy *et al.*, 2010. See also Muniesa, 2014). Repo contracts attempt to transform

private debt obligations into ‘safe’ assets by relying on markets for collateral, but founder on the problematic ‘reality’ of the neoclassical construction of markets. The shift to repo by simultaneously putting neoclassical theory into effect and changing the way the object of the theory, the ‘market’, is performed, in practice has the effect of subverting the theory. Before 2008 the neoclassical theory of market liquidity was often viewed by financial economists as a simple, but not unreasonable, description of financial markets most of the time. Subsequent to the crisis that demonstrated the instability of repo-based financial markets, governments, not markets, have begun to be viewed as the fundamental source of liquidity, displacing the neoclassical view. That is, the repo-driven 2008 liquidity crisis is an example of counterperformativity because repo ultimately undermined support for the neoclassical approach to market liquidity (cf. MacKenzie, 2006).

In the first section a schematic for comparing repo-based modern markets to the traditional banking system is presented. The schematic uses the techniques of balance sheet analysis developed by Minsky’s followers (Bell, 2001; Mehrling, 2011; Wray, 1990) to show how the banking system – that is, the banks with the support of the central bank – supports the economy through temporary periods of illiquidity by allowing the illiquid assets to lie hidden on the balance sheets of the banks until the liquidity event is over. Thus, in contrast to neoclassical theory where markets robustly provide liquidity, here the banking system supports liquidity when market liquidity fails. This argument builds on previous work which finds that during the 19th and early 20th century, markets in Britain were stabilized by a carefully calibrated banking system (Sissoko, 2016a) and argues that the neoclassical economic model, by abstracting from money and banking, effectively assumes this stabilizing role (Sissoko, 2007). When this balance sheet approach is applied to repo-based modern markets, we find that losses due to theory-

disrupting liquidity events show up on balance sheets. Pozsar (2014, 2015)'s analysis of repos and the leveraging of bond portfolios provides an important foundation for this discussion, and his papers are referenced throughout. The balance sheet approach embraces the view that the essence of money is debt (Ingham, 2006; Wray, 1990), but diverges from these authors by emphasizing the importance of private sector institutional structures to financial stability and by deemphasizing – without denying the existence of – sovereign backing that also plays a stabilizing role. Using this approach clarifies why the shift to a repo-based financial system has been destabilizing.

The second section focuses on the consequences of the growth of repo and margin contracts: in the contemporary system a segment of the market necessarily realizes losses during a liquidity event. In an effort to avoid incurring such losses all participants prefer even in normal times to use as collateral 'safe haven' assets that will tend to hold their value in a liquidity crisis. The result is a segmentation of the asset market with 'safe assets' trading differently from other assets. The term 'safe asset' refers to an asset that is preferred as repo collateral (Boy, 2014; Gorton *et al.*, 2012), and not to an asset with almost no price risk: Treasury bonds – which change value dramatically when interest rates change – are considered 'safe assets' (Boy, this volume). This paper posits that the preference for 'safe assets' derives from the fact that they are unlikely to fall in value during a liquidity crisis, and thus explains why the excess demand for safe assets that some treat as an exogenous characteristic of the modern economy (e.g. Caballero & Farhi, 2013) has arisen.

The relationship between the structural illiquidity of the modern market-based financial system and 'secular stagnation' is explored in the third section. Implications for our understanding of safety and collateral are discussed in the concluding section.

From bank-based markets to a modern markets system

Since the 1980s financial systems around the world have been transformed as the growth of market-based lending has displaced bank lending (Cetorelli *et al.*, 2012; Gabor & Ban, 2016; Hardie *et al.*, 2013; Mehrling, 2011). The US financial system is the focus of this paper, and an extensive literature classifies the US system even in the early and middle years of the twentieth century as a ‘market-based’ financial system by comparison with German-type financial systems (see e.g., Allen & Gale, 1999; Levine, 2002). To acknowledge this established nomenclature while at the same time recognizing that in the United States the term ‘market-based’ finance refers to the more recent phenomenon of bank disintermediation, I will use the terms ‘bank-based markets’ and ‘modern markets’ to describe the pre-1980s US financial system and the modern US financial system respectively. Note, however, that ‘modern markets’ are very dependent on the central bank, and arguably dependent on one or more of the larger banks to make markets work.⁷

I analyse this transformation using a balance sheet approach that allows me to keep track of what is happening to both assets and liabilities. Using balance sheets, it becomes clear that market-based lending’s displacement of bank lending on the asset-side of bank balance sheets was accompanied by a reduction in deposits on the liability-side. The growth of money funds as a substitute for deposits was instrumental in this process. The structure of this transformation is explained in two diagrams below. Figure 1 depicts the role of banks in the bank-based markets system, where banks make loans and hold them to term on their balance sheets. The ‘entities’ are the key categories of participants in the system, each of which has its own balance sheet. Implicit in the concept of ‘having a balance sheet’ is the fact that each entity has an equity stake at risk and may also carry some debt. From this perspective anyone whose only asset is a deposit and who owes nothing, by definition, has an equity position equal to the deposit. The ‘instruments’

are the key categories of financial assets that the banks use in order to play the role that they do in the economy. These assets are liabilities for the entity to the left of the instrument and assets for the entity to the right of the instrument. The ‘services’ refer to the key services that are associated with the instrument in question and that the banking system provides.

Figure 1 HERE

The economics literature frames banks as intermediaries and focuses on the role played by banks in lending: banks perform risk analysis, act as delegated monitors, and transform the maturity of debt. This ‘banks as intermediaries’ approach abstracts from the role played by the bank balance sheet in protecting depositors from losses. Banks after all don’t just intermediate. Depositors can only lose money if a bank fails. So, banks – and the equity and subordinated debt that comprise the lower tiers of a bank’s capital structure – literally stand between depositors and the danger of losses on loans. In addition, because the central bank stands ready to provide liquidity to support banks through a systemic event, it also alleviates the danger that price fluctuations due to fire sales will impose losses on depositors (Diamond & Dybvig, 1983; Minsky, 2008 [1986]). In this way, the banking system – that is, the banks together with the central bank – provides protection from liquidity crises to depositors.⁸ Thus, in the bank-based markets model, the role of the banking system is to bear risk for the real economy: bank owners bear the credit risk of bank loans, and the banking system bears liquidity risk by making it possible for temporary declines in asset values to lie hidden on the balance sheets of banks that receive central bank support until the under-valuations disappear. The banking

system functions as a mechanism that prevents liquidity strains from being transmitted directly to the real economy.

Because of the essential liquidity-supporting role played by banks in the economy, they have for centuries been subject to industry-specific regulation. For example, in the nineteenth century when banks were first granted the privilege of corporate status protecting bank owners from unlimited liability on the bank's debts, bank-specific capital rules were also adopted. These rules were clearly designed to ensure that in the event of a bank failure, bank owners and not bank creditors would bear the losses – and they were largely successful (Macey & Miller, 1992; Turner, 2014). In the twenty-first century government-provided deposit insurance covers US depositors up to \$250,000, and this policy is accompanied by careful regulation and supervision of bank assets and capital. US-style regulation of depository institutions is apparently sufficient to prevent runs on deposits, given that through the 2007-2008 crisis the United States did not experience this type of run.

This balance sheet approach emphasizes the loss protection and liquidity services provided by banks, establishing an alternative model to that of banks primarily engaged in maturity transformation. These two approaches should be treated as complements: both models are needed if we are to understand the role that banks play in the economy. I acknowledge, however, that the literature on maturity transformation and on bank runs indicates that banks are an imperfect solution to the problem of market liquidity (Allen & Gale, 1999; Diamond & Dybvig, 1983). Even so, the question this paper poses remains: Is financial stability more readily achieved by supporting a traditional deposit-funded banking system with deposit insurance, supervision, and access to a central bank or by disintermediating banks and relying more heavily on markets? The fact that banks are imperfect is not an answer to this question.

This traditional bank-based system contrasts with the modern markets system, where money flows in not from depositors, but from investment funds, and a crucial source of this inflow comes from funds that focus on cash-like assets, or ‘cash pools’.⁹ Because investors in cash pools expect to be able to liquidate their holdings without loss instantly, cash pools serve as deposit alternatives and to do so must expose themselves to minimal risk of default. For this reason, they invest only in the safest of short term secured and unsecured assets.¹⁰

This paper focuses on the economic role of the cash pools’ investments in secured assets, or repos, which comprise a substantial fraction of their total assets.¹¹ In a repo, a contract to sell a marketable asset is entered into simultaneous with a contract to repurchase the asset at a specified price and time, making it the economic equivalent of a secured loan. The safety of the repo derives from the marketability of the collateral and the terms of the standard repo contract: a repo is over-collateralized – or, in other words, there is a ‘haircut’ on the amount of money that can be borrowed against each dollar of collateral – and the collateral position must be maintained over time. Thus, if there is a haircut of 5 per cent on \$1 million of collateral posted, only \$0.95 million can be borrowed. As long as the \$0.95 million loan is outstanding the collateral will be valued on a daily basis and a collateral call will be issued on the day that the value of the collateral falls below \$1 million.¹² If the borrower does not meet the collateral call within a day or two, the lender has the right to sell the collateral and use the proceeds to settle the loan. Because any remaining proceeds after the loan has been paid off are returned to the borrower, the lender – and seller of the collateral – has no incentive to seek out the best price for the collateral. In short, in a repo contract the borrower and owner of the asset conditionally gives up control over the asset, and this can result in a forced sale that will not be in the borrower’s interest if the price of the collateral has fallen only temporarily.

Overall, a lender will never lose money on a properly managed repo loan,¹³ and repos are genuinely safe assets independent of the riskiness of the collateral they finance. The particular characteristics of a repo that make it so safe are also the characteristics that make it an alternative to a deposit for cash investors.¹⁴ In fact, a repo is clearly safer than an uninsured deposit, and this explains why corporations and investment funds generally prefer lending on repo to leaving their money with banks in amounts that are both uninsured and unsecured (Pozsar, 2015).

While cash pools now have a safer place than banks in which to hold their funds, this protection is contractual and therefore provided by those who are borrowing on repo. My analysis below indicates that repos are safe because investment funds that hold long-term assets like bonds, such as pension funds, mutual funds, and hedge funds, bear the risk of liquidity crises. These investment funds that invest in long-term assets are categorized as ‘long pools’. In the modern markets system long pools replace banks as the economy’s risk-bearer.

Figure 2 here

Figure 2 draws connections between the traditional role of banks and the modern markets system by laying out how the latter uses different entities and different instruments to provide many, but not all, of the services furnished by the banking system. In the diagram we see that the repo market offers loss protection, but not a liquidity cushion. The diagram distinguishes between two different repo markets, both of which finance marketable collateral, but do so by providing distinct types of security for the lender. In the tri-party repo market the collateral is held and managed on behalf of the lender by a third party, the clearing bank. This allows lenders that do not have the capacity to manage collateral – such as money market funds – to lend on the repo market without

relying on the repo borrower to hold and manage the collateral on the lender's behalf.¹⁵ By contrast in the bilateral repo market lenders are typically investment banks (also known as dealer banks) that manage the collateral posted themselves, and the borrowers are long pools that may also be derivatives counterparties and brokerage clients of the lenders. Cash pools generally do not use the tri-party repo market to lend directly to the long pools, first of all because they may not want to be exposed to them as counterparties or to the collateral they seek to post, and second because they do not have the means to offer the services that the long pools are seeking. Dealers prefer to lend on the bilateral repo market because in addition to the right to sell the collateral outright in the event of default, they also have the right to use the collateral while the repo is outstanding (Baklanova *et al.*, 2015). Thus, in the bilateral repo market (but not in the tri-party repo market) the lender may 'rehypothecate' the collateral or post it in another transaction.¹⁶

To summarize, cash pools make collateralized loans on the tri-party repo market to dealer banks, which in turn make collateralized loans on the bilateral repo market to long pools. The collateral in both repo markets is composed mostly of assets originally owned by the long pools, since approximately 80 per cent of the collateral posted by the dealer banks in tri-party repo market transactions is being rehypothecated and was previously posted to the dealer banks in the bilateral repo market by the long pools (Pozsar, 2015). When a dealer bank funds bilateral repo lending by borrowing in the tri-party market using the same collateral, the dealer is said to be running a 'matched book'.

Long pools are the link between long-term borrowers and the repo market. Long pools, including pension funds, mutual funds, and hedge funds, invest in securities that finance governments, corporations, and through securitizations a variety of other loans such as mortgages. Long pools often choose to increase their funds available for investment by using a portion of these long-term assets to borrow from the dealer banks

on the bilateral repo market. Long pools may also post some of these long-term assets to meet the margin requirements of their derivatives and short positions.¹⁷

For the most part, however, long pools are financed by equity and their borrowing is limited. The Investment Company Act of 1940 limits the capacity of ‘regulated investment companies’ – a category that includes mutual funds, but not hedge funds – to borrow. In addition, past experience, such as Long-Term Capital Management’s failure in 1998, has alerted both hedge funds and dealer banks to the dangers of excessive collateralized debt, so in recent years the median hedge fund has been leveraged only two to one (Securities and Exchange Commission, 2018).¹⁸ Even though many long pools borrow little or not at all, those long pools that do borrow are likely to choose repo and margin liabilities over longer-term forms of debt for two reasons: First, current interpretations of the law allow regulated investment companies to take on leverage via derivatives and repo exposures (IMF, 2015; Pozsar, 2015). Second, the value over time of long-term assets is so uncertain that lenders on collateralized markets are willing to permit more leverage when the term of the loan is shorter (Geanakoplos, 2010). Thus, long pools that wish to make highly leveraged investments may find that the repo market is the only venue where the leverage they seek is available. Moreover, since most of the collateral that is posted by dealer banks in the tri-party repo market comes from bilateral repo transactions, cash pools that seek to lend on the tri-party repo market can only find borrowers because there are long pools borrowing on the bilateral repo market and posting margin against derivatives liabilities (Pozsar, 2015). Thus, it is unremarkable that a wide variety of long pools borrow on this market.

As a result of this structure, when long pools borrow from dealer banks on the repo market, it is the equity investors in these funds who are providing loss protection in the form of over-collateralization and the obligation to meet margin calls to the dealer

banks. When the dealer banks fund these transactions by entering into trades in the tri-party repo market, the dealer banks provide loss protection to the cash pools and the dealer banks' balance sheets are at risk. On the other hand, in a matched book trade a dealer bank will be able to fund any collateral call using a matching collateral call made on a long pool. Thus, in the case of matched book repo, the overall effect is that the equity investors in the long pools are providing loss protection to the cash pools that lend on the tri-party repo market – with the added protection for the cash pools that the dealer banks are also fully liable on the tri-party repo loans.

Notably absent from Figure 2 is the liquidity cushion that the banking system provides to depositors. Behind market-based lending sits the neoclassical view that market prices represent reality, so investors in long funds *should* be exposed to price-based losses. Thus, both mutual funds and exchange traded funds¹⁹ are designed to reflect such changes. And even funds that emphasize a long-term approach rather than immediate liquidity, such as pension funds and hedge funds, report their market value to their investors or beneficiaries on a regular basis. For this reason, when repo-based finance results in a theory-disrupting liquidity event, modern markets are designed to place the burden of losses on the repo borrowers, that is, on the long pool investors – and any dealer banks who do not manage the matching of their books carefully. This has consequences for the behaviour of borrowers, which I will turn to now.

Consequences of market-based lending

The modern markets system as it has evolved in the twenty-first century has serious disadvantages. Because the safety provided to lenders is created by contractual structure, it is offset by danger to borrowers. To deal with the danger of liquidity events, borrowers exhibit a strong preference for a limited class of 'safe haven' assets. This section explains

the risks faced by borrowers and the segmentation of markets that results.

Repo contracts convert price declines into liquidity events

The corollary to the displacement of deposits by repos is that, in the event of a decline in collateral value, repo borrowers may be forced to sell the collateral. The consequence of forced selling on any significant scale is a liquidity event in the asset subject to the sale. Keynes (1997 [1935]) explained how traders' investment decisions drive the dynamics that create a liquidity event:

the energies and skill of the professional investor are mainly occupied ... not with making superior long-term forecasts of the probable yield of an investment over its whole life, but with foreseeing changes in the conventional basis of valuation a short time ahead of the general public. ... [This] is an inevitable result of an investment market [which revalues investments every day enabling the individual to revise his commitments.] ... For it is not sensible to pay 25 for an investment of which you believe the prospective yield to justify a value of 30, if you also believe that the market will value it at 20 three months hence.

In other words, when those who are in a position to recognize that the asset is undervalued also have reason to believe that forced sales are driving the price dislocation, they are unlikely to put in any but a deliberately undervalued bid until they have reason to believe that the forced selling of the asset is near completion. The accuracy of Keynes' description of market behaviour is supported by modern experience: liquidity events in securities prices were witnessed with regularity from 2007 through 2008 (Barr, 2007; Dizard, 2008; Mackintosh, 2008a, 2008b, 2008c).

On the other hand, it is true that a liquidity event which drives price down temporarily can simply be ignored by an unleveraged investor with a long-term horizon, that is, by an investor with no need to sell the asset. Thus, some investors can, like banks,

smooth the effects of liquidity crises by holding assets through them. The modern markets system is, however, characterized by repo-based leverage that generates an environment where liquidity events are accompanied by forced selling, the expectation of forced selling, and repo borrowers who realize losses. In short, as many have observed, repo contracts are inherently procyclical and can easily play a key role in transforming a simple price decline into a liquidity event, losses, and bankruptcies (Adrian & Shin, 2010; Brunnermeier & Pedersen, 2009).

Long pools realize losses during liquidity events

Long pools aggravate the liquidity problems created by repo markets in two ways. First, the subset of long pools that is leveraged is forced to realize losses during liquidity events. Because they face margin calls, some of them will be subject to forced sales, and a few may be forced to liquidate entirely. It should be noted that being a ‘small’ borrower is not protection against such a liquidity event, because it is certain that other investors will hold the same assets as the small borrower. As a result, any borrower can be caught up in a liquidity event triggered by another market participant or by a group of borrowers that follows a similar strategy.²⁰ Such liquidity events impose losses on investors in leveraged funds that reflect gross underperformance relative to benchmarks and expose the asset managers who were relying on derivatives and the leverage they facilitate. The most widely publicized example from the 2008 crisis of a leveraged mutual fund is the Oppenheimer Core Bond Fund, which was an important component of state-sponsored college savings plans for a cluster of US states. The fund lost 36 per cent over the course of 2008 – a period over which comparable funds lost only 5 per cent (Oregon DOJ, 2009; see also Jacobson, 2009).

Second, unlike an unleveraged individual investor, for a long pool the decision not to sell assets does not lie entirely within the discretion of the managers of the fund. The exit decisions taken by a subset of mutual fund investors can force the fund as a whole to recognize losses when riding out the liquidity event would be a better choice. This then creates a run dynamic, as the investors who exit first will generally earn better returns than those who exit later. The effect of this long pool property is that even if a long pool investor knows that market prices are falling due to a liquidity event and will over time rise again, it will be rational for the investor who is concerned about a run to make every effort to be among the first to exit (Cetorelli *et al.*, 2016; Goldstein *et al.*, 2017). Although the structure of an exchange-traded fund is more complex, the exit of investors from such funds can also affect the prices of the underlying assets (Ben-David *et al.*, 2014). Even hedge fund managers, who typically limit the ability of an investor to exit, find that liquidity events of significant duration expose the hedge fund to similar spillover effects. Overall, many of the long pools that bear the losses in the modern markets system are prone to rational runs that add to the problem of forced sales.

To summarize, the modern markets system, which is founded on the neoclassical framework that assumes that markets are a source of liquidity, has the effect in real world markets of placing the burden of liquidity-based losses on end investors. Because long pool investors are forewarned that their principal is at risk, the neoclassical view is that they should bear these losses – unless there was a breach of duty by a seller or fiduciary. These losses include not only temporary fluctuations in wealth caused by price movements, but also realized losses when a theory-disrupting liquidity event forces sales either due to leverage or to investor exits. Thus, the absence of a liquidity cushion in the modern markets system maps directly to the liquidity-driven losses borne mostly by

leveraged end investors. The banking system, by contrast, allows such losses to be avoided, by enabling banks to ‘hide’ temporarily illiquid assets on their balance sheets.

Excess demand for “safe” assets

The risk-free real interest rate has declined significantly – and fairly steadily – from the late 1990s to the present (Bean *et al.*, 2015), but the interest rates paid by private sector borrowers have not declined in a similar fashion. Thus, over this time period the difference – or spread – between the interest rates paid on privately issued assets and on Treasuries has widened. In Figure 3 we see that since the late 1990s – or since the risk-free real interest rate has been declining – spreads have remained well above their pre-1998 long-run average (see also Illes & Lombardi, 2013; Kwan, 2014). Many observers describe the current environment as one where there is an excess demand for safe assets (see e.g., Caballero & Farhi, 2013; Kocherlakota, 2014). An alternate way to describe this phenomenon is as a segmentation of asset markets: the substitutability of riskier assets for safe assets has declined markedly.

Figure 3 here

This excess demand for safe assets can be explained by the structural shift towards repo-type collateralized lending and by the extraordinary protection provided to lenders by repo borrowers in the modern markets system. For example, as lenders the dealer banks in 2008 protected themselves through the crisis by issuing margin calls and raising the haircuts they imposed on repo collateral and this triggered the failure of some of the more leveraged hedge funds. These events accentuated a basic fact with which the more experienced market participants were already familiar: for the borrower the safest forms of collateral are those that even in the worst of circumstances will have relatively small

haircuts. Because the expected price volatility of an asset is a key determinant of the asset's haircut, in the United States Treasuries are the safest bonds to use as collateral (Gabor & Vestergaard, 2016).

Thus, I interpret Figure 3 as follows: prior to the crisis the marginal market participant was willing to post riskier private sector assets as collateral and this drove spreads down. On the other hand, many market participants were alert to the possibility of liquidity events when posting riskier forms of collateral which kept the spread above the former average. Post-crisis all participants realized that only a very select group of assets maintains its value during a liquidity event. This generated a strong preference for safe haven assets even in normal times as protection against the onset of a crisis. Subsequently the use of riskier assets as collateral has become much less common and for this reason spreads have risen and remain bounded away from the previous long-term average. Indeed, in recent years spreads are typically at a level comparable to the highs of previous cycles. In short, the structural shift in financial markets towards repo-type lending has so changed the nature of the demand for safe assets that the bond market has become segmented: the highest quality sovereign bonds, which make the best collateral, cannot be replaced by riskier debt (see also Pozsar, 2015).²¹

Figure 4 here

This view of the economic consequences of the growth of repo markets is supported by both theoretic modelling and the data on the use of collateral in financial markets. Fostel and Geanakoplos (2016) model the use of a commodity as collateral and find an 'overvaluation' effect: when demand to use an asset as collateral is added to other sources of demand, this raises the asset's price and lowers its yield relative to the

environment where it is not used as collateral. More importantly, the timing of the growth in the use of collateral on financial markets – and its counterpart the rise of cash pools – coincides very closely with the observed decline in the risk-free real interest rate. Figure 4 shows that the use of collateral in over-the-counter derivatives contracts increased six-fold from 1999 to 2006, and then tripled over the course of 2007 and 2008.²² Similarly, over the course of the 1990s the repo market grew slowly, but then tripled in size from the late 1990s through 2008 (Klee & Stebunovs, 2011; FSOC, 2014). Both markets shrank abruptly in 2008, but then stabilized, the repo market at double its size in 1999 and the derivatives collateral market at 15 times its 1999 size (ISDA 2015). Pozsar (2014) documents that the timing of the growth of cash pools is comparable. Overall, data supports the view that the growth of repo-type lending has resulted in an environment where credit is simultaneously abundant for those that least need to borrow and relatively scarce for the private sector borrowers who are presumably best positioned to put the funds to good use.

Secular stagnation: Growth in a structurally illiquid economy

The secular stagnation hypothesis²³ posits that the world in which economic policymakers act has changed: in the past monetary policy could be used to balance the goals of maintaining employment and restraining inflation, and supervision was presumed to be adequate to prevent financial instability. Now the excess of saving over investment is chronic, and monetary policy may be incapable of rebalancing the economy without destabilizing the financial system. The principal evidence of a structural problem is that policy rates have remained at zero for seven years, even as economic activity has been far from robust (Summers, 2014, 2015). Thus, the secular stagnation hypothesis builds on the ‘global savings glut’ hypothesis which attributes these anomalous interest rates

largely to the savings behaviour of emerging market countries (Bernanke, 2005, 2015b). Quantity-wise, however, the more important shift in savings behaviour was that of the developed world's corporate sector: the 'savings glut' is best understood as an investment famine (Gruber & Kamin, 2015; Loeys *et al.*, 2005; Portes, 2007; Wolf, 2013). Figure 5 depicts the net savings of US corporations which have been positive since 2001 – with the exception of 2007-2008 when many corporations were probably forced to run down their savings or borrow in order to get through the crisis. This change in behaviour is both unprecedented and 'unnatural', as corporations should be best positioned to find investment opportunities and to be 'natural' borrowers when they exploit these opportunities. Because this shift has taken place across most of the high-income countries, a general explanation of this corporate behaviour is needed.

Figure 5 here

Economists who advance the secular stagnation hypothesis struggle to explain why this structural excess of savings over investment has arisen, and in the absence of a clear explanation, the economists who reject the secular stagnation hypothesis are probably as numerous as those who accept it (Bernanke, 2015a; Eichengreen, 2014). This article proposes a very different explanation for the fact that risk-free interest rates declined for a decade and have remained at zero for more than seven years: our financial structure has changed. The growth of the modern markets system and the associated repo-type collateralization of financial sector liabilities has made liquidity crises endemic. Market participants have responded by segmenting the market: an asset is either expected to have safe haven status in a crisis or it is not – and only the safe haven assets make good collateral (cf. Pozsar, 2015).

This new world where liquidity events are endemic exhibits several characteristics that serve to entrench the problem of illiquidity. First, liquidity events necessarily result in ‘winners’ and ‘losers’ – where the winners are those who hold a liquid cash position during the liquidity event and recognize the value of buying as the forced selling comes to an end. Second, in such an environment those with the most resources are better positioned to maintain a liquid position and therefore to purchase at fire sale prices. Thus, when liquidity events are endemic there is little hope that a middle class that was hit by significant losses in the last crisis will recover its position over time, because – at least in the aggregate – the middle class is almost sure to be liquidity constrained at the moment when there are windfall profits to be made. Overall, the shift in financial markets structure may be aggravating the growing inequality that has been so thoroughly documented in recent years (Lysandrou, 2011; Piketty, 2013). A related point is that in an economy prone to liquidity events, there are few prospects that the average consumer will recover the confidence in the future that is necessary for economic recovery. And when the prospects for recovery are dim, businesses have little motivation to invest, further reducing these prospects and increasing the likelihood that it is in a cash-rich corporation’s interest to hold a liquid position that will allow it to take advantage of the next liquidity event (cf. El Erian, 2016). In short, just as liquidity begets liquidity (Foucault *et al.*, 2013), illiquidity also feeds upon itself.

If this analysis is correct, then it is true, as secular stagnation theorists argue, that escape from stagnation cannot be achieved using the traditional tools of monetary policy – but it is equally true that fiscal policy will simply serve as an analgesic. This critique can also be applied to policy proposals that are specifically addressed to the problem of low interest rates and a ‘safe asset shortage’. An increase in the debt issuance of those sovereigns whose debt is treated as safe (Caballero & Farhi, 2014; Kocherlakota, 2016;

Pozsar, 2015) may, like fiscal policy, serve to ease the distress caused by weak economic performance, but fails to address root causes. Similarly, implementation of very strict regulation of issuers – possibly combined with government insurance – to convert privately issued debt into safe assets (Gorton & Metrick, 2010) addresses only the symptoms, not the underlying problem.²⁴

A third policy option addresses the price instability generated by repo markets directly: the central bank can step in to backstop markets and forestall the consequences of a fire sale (Bryan & Rafferty, 2013; Gabor & Vestergaard, 2016; Mehrling, 2011).²⁵ Indeed, most advocates of this option argue that this would be a natural extension of the traditional lender of last resort role of the central bank to the modern ‘market-based’ financial system. While this proposal has the advantage of addressing the price instability that lies at the root of the economic malaise, the question that arises is why direct central bank intervention in markets is an improvement over the traditional system’s intermediated central bank support of markets. After all, the growth of ‘market-based’ finance has transferred less liquid assets out of banks and onto markets, the effect has been destabilizing, and the proposed solution is for the central bank to provide direct support to the value of these illiquid assets. Unsurprisingly, the capacity of the central bank to do a better job than the market of determining the ‘true’ price of these assets has been questioned (e.g., King, 2016). By contrast, the advantages of bank-based markets lie in their built-in protections when dealing with assets mispriced due to a liquidity event. First, the banks are supervised, so the central bank can enforce standards on both bank management and bank capital in normal times before a crisis arises. Second, the loans are recourse loans, so the central bank is only exposed to losses on the assets if the borrowing bank fails. As a result, when a loan is under-collateralized the traditional lender of last resort is protected by both the borrowing bank’s balance sheet and the central bank’s

knowledge of the quality of that balance sheet. Thus, proponents of direct central bank intervention in markets must answer the question: Why is it a better solution to this problem to assign what may be an impossible task to central banks rather than to simply require that the assets that are prone to illiquidity be migrated back onto bank balance sheets? Perhaps these proponents can come up with a system that addresses the inevitable overpricing of illiquid assets by central banks as well as old-fashioned bank-based markets did, but to my knowledge no such detailed proposal has been made.

Sceptics of the banking system have for generations argued for a fourth policy option: the financial system would be made more stable by eliminating the role played by banks in lending and by adopting 100% reserve banking, that is, by requiring banks to hold as assets only central bank liabilities or government debt (Benes & Kumhof, 2012; Cochrane, 2014; Kotlikoff, 2010; Levitin, 2016; Phillips, 1996; Wolf, 2014).²⁶ Proponents of such reform have argued that investment funds are capable of supporting the same quantity and quality of debt as the banking system. The growth of the modern markets system gives us a window into what would likely be the actual consequences of such a reform. The problem with markets is that they provide liquidity in normal times, but this source of liquidity evaporates when prices are expected to fall. Both repo-based leverage and the prevalence of investment pools increase the frequency of liquidity events on markets. By eliminating the ability of banks to keep illiquid assets on their balance sheets – with central bank support – these reformers will subject the economy to the full force of the liquidity events that are intrinsic to markets (see King, 2016), and as in the modern markets system there will be great value to having a liquid portfolio in a crisis. By contrast, bank-based markets rely on the central bank to smooth liquidity events so that the value of being in possession of a liquid portfolio remains fairly stable. Overall, the banking system's traditional function is to stabilize unstable markets, and we will

likely find that the only solution – if financial stability is our goal – is the reintermediation of the banking system.

Conclusion: Implications for our understanding of safety and collateral

The traditional role of the banking system is to provide a modicum of safety to both the lenders and borrowers in the economy by engaging in maturity transformation, by protecting depositors from losses on bad debt, and by insulating the real economy from liquidity events. The growth of ‘market-based’ finance has been accompanied not just by a shift away from bank lending and towards collateralized lending, but more importantly by a shift of the balance of power in debt contracts: the modern world of repo-based finance is built on contracts that favour lenders to the greatest degree possible. Thus, the unprecedented security that collateral provides to lenders in modern markets is grounded in the ubiquitous use of a contractual structure based on repo. The ultimate result of this shift has been a self-protective change in investment fund behaviour that exacerbates liquidity problems and undermines economic performance by reducing the financing available for private borrowers.

The growth of repo markets has had these effects, because repo markets convert a simple decline in collateral prices into a liquidity event via the collateral calls and collateral sales that are integral to the operation of repo. That is, the same contractual structure that empowers lenders also drains liquidity from the financial system. During these liquidity events, repo borrowers realize losses, and in light of the dangers of repo borrowing, these borrowers exhibit a strong preference for the safest collateral – that issued by the highest quality sovereigns. This segmentation of asset markets explains the ‘safe asset’ shortage, the comparatively high cost of corporate borrowing, and the slowdown in both business activity and the finance of business activity.

This repo-driven shift in socio-economic relations to the advantage of lenders and the detriment of borrowers has not only displaced the economy's traditional source of liquidity, the banking system, but has also disrupted neoclassical theory itself. Neoclassical theory views markets as inherently liquid. Repo, by putting neoclassical theory into effect, exposes the contradictions in the theory. The final result is counterperformative. Repo by taking neoclassical theory seriously, has played an important role in its ultimate rejection: now government is almost universally viewed as a far more important source of liquidity than markets.

Indeed, many argue that sovereign-issued 'safe assets' are the cornerstone upon which the financial system is built. The purpose of a financial system is, however, to manage risk, not to avoid it, and I show here that repo, the safest of assets, in fact, hobbles the financial system. Safety for the individual is a trap for the economy.

This conundrum of safety is constructed on the conundrum of collateral, which in turn is constructed on the conundrum of liquidity. As Keynes observed eighty years ago, there is no such thing as liquidity for the economy as a whole. I explain here that the traditional support for economy-wide liquidity is the banking system which exists to balance the various forces that make up the market by offering a small measure of safety to all participants.

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References

- Adrian, T. & Shin, H.S.** (2010). Liquidity and leverage. *Journal of Financial Intermediation*, 19(3), 418 – 437.
- Allen, F. & Gale, D.** (1999). *Comparing financial systems*. Cambridge, MA: MIT Press.
- Anderson, A.** (1787). *An historical and chronological deduction of the origin of commerce*. London: Logographic Press.
- Baklanova, V., Copeland, A. & McCaughrin, R.** (2015). Reference guide to US repo and securities lending markets. Office of Financial Research Working Paper No. 15-17.
- Barr, A.** (2007, August 9). Big liquidation triggers hedge-fund turmoil. *Marketwatch*, Retrieved from <http://www.marketwatch.com/news/story/portfolio-liquidation-triggers-turmoil-among/story.aspx>
- Bean, C., Broda, C., Ito, T. & Kroszner, R.** (2015). Low for long? Causes and consequences of persistently low interest rates. CEPR Geneva Reports on the World Economy 17.
- Bell, S.** (2001). The role of the state and the hierarchy of money. *Cambridge Journal of Economics*, 25(2), 149 – 163.
- Ben-David, I., Franzoni, F. & Moussawi, R.** (2014). Do ETFs increase volatility? NBER Working Paper 20071.
- Benes, J. & Kumhof, M.** (2012). The Chicago plan revisited. IMF Working Paper WP/12/202.
- Bernanke, B.** (2005, March 10). The global saving glut and the US current account deficit. [Speech]. Federal Reserve Board of Governors, Washington, D.C.
- Bernanke, B.** (2015a, March 31). Why are interest rates so low, part 2: Secular stagnation [Blog post]. Retrieved from <http://www.brookings.edu/blogs/ben-bernanke/posts/2015/03/31-why-interest-rates-low-secular-stagnation>
- Bernanke, B.** (2015b, April 1). Why are interest rates so low, part 3: The Global savings glut [Blog post]. Retrieved from <http://www.brookings.edu/blogs/ben-bernanke/posts/2015/04/01-why-interest-rates-low-global-savings-glut>
- Bookstaber, R.** (2008). *Demon of our own design*. Hoboken, NJ: Wiley.
- Boy, N.** (2014). The backstory of the risk-free asset: How government debt became ‘safe’. In C. Goodhart, D. Gabor, J. Vestergaard & I. Erturk (Eds.), *Central banking at a crossroads* (pp. 177 – 187). London: Anthem Press.
- Boy, N.** (forthcoming). The financial value of safety: exploring the material and immaterial yield of security. *Economy and Society*.

- Brunnermeier, M. & Pedersen, L.** (2009). Market liquidity and funding liquidity, *Review of Financial Studies*, 22(6), 2201-2238.
- Bryan, D. & Rafferty, M.** (2013). Fundamental value: A category in transformation. *Economy and Society*, 42(1), 130-153.
- Caballero, R. & Farhi, E.** (2013). A model of the safe asset mechanism (SAM): Safety traps and economic policy. NBER Working Paper 18737.
- Caballero, R. & Farhi, E.** (2014). On the role of safe asset shortages in secular stagnation. In C. Teulings & R. Baldwin (Eds.), *Secular stagnation: Facts, causes and cures* (pp. 111-122). London: CEPR Press.
- Cetorelli, N., Duarte, F., & Eisenbach, T.** (2016, February 18). Are asset managers vulnerable to fire sales? [Blog post]. Retrieved from <http://libertystreeteconomics.newyorkfed.org/2016/02/are-asset-managers-vulnerable-to-fire-sales.html>
- Cetorelli, N., Mandel, B. & Mollineaux, L.** (2012). The evolution of banks and financial intermediation: Framing the analysis. *Federal Reserve Bank of New York Economic Policy Review*, 18(2), 1-12.
- Claessens, S., Ashoka M. & Vallée, S.** (2012). Paths to Eurobonds. IMF Working Paper WP/12/172.
- Cochoy, F., Giraudeau, M. & McFall, L.** (2010). Performativity, economics and politics: An overview. *Journal of Cultural Economy*, 3(2), 139-146.
- Cochrane, J.** (2014). Toward a run-free financial system. In M.N. Bail & J. Taylor (Eds.), *Across the great divide: New perspectives on the financial crisis* (pp. 197-249). Palo Alto, CA: Hoover Institution Press.
- Diamond, D. & Dybvig, P.** (1983). Bank runs, deposit insurance, and liquidity. *Journal of Political Economy*, 91(3), 401 – 419.
- Dizard, J.** (2008, November 18). In a weird world, yields on Tips point to deflation. *Financial Times*. Retrieved from <http://www.ft.com/cms/s/0/37101d00-b511-11dd-b780-0000779fd18c.html>
- Eichengreen, B.** (2014). Secular stagnation: A review of the issues. In C. Teulings & R. Baldwin (Eds.), *Secular stagnation: Facts, causes, and cures* (pp. 41-46). London: CEPR Press.

- El-Erian, M.** (2016, February 12). Investors try to ride out an improbable storm. *Bloomberg View*. Retrieved from <http://www.bloombergvew.com/articles/2016-02-12/investors-try-to-ride-out-an-improbable-storm>
- Esposito, E.** (2013). The structures of uncertainty: Performativity and unpredictability in economic operations. *Economy and Society*, 42(1), 1 – 28.
- Federal Reserve Board of Governors** (1943). *Banking and monetary statistics 1914-1941*. Washington, DC: Federal Reserve Board of Governors.
- Financial Stability Oversight Council (FSOC)**. (2014). *Annual report*. Washington, DC: FSOC.
- Fostel, A. & Geanakoplos, J.** (2016). Financial innovation, collateral, and investment. *American Economic Journal: Macroeconomics* 8(1), 242–284.
- Foucault, T., Pagano, M. & Roell, A.** (2013). *Market liquidity: Theory, evidence, and policy*. Oxford: Oxford University Press.
- Gabor, D.** (2016). The (impossible) repo trinity: The political economy of repo markets. *Review of International Political Economy*, 23(6), 967 – 1000.
- Gabor, D. & Ban, C.** (2016). Banking on bonds: The new links between states and markets. *Journal of Common Market Studies*, 54(3), 617 – 635.
- Gabor, D. & Vestergaard, J.** (2016). Towards a theory of shadow money. INET Working Paper.
- Gabor, D. & Vestergaard, J.** (2018). Chasing unicorns: The European single safe asset project. *Competition & Change*, 22(2), 140–64.
- Geanakoplos, J.** (1987). Arrow-Debreu model of general equilibrium. In J.Eatwell, M.Milgate & P.Newman (Eds.), *New Palgrave dictionary of economics* (pp. 116-124). London: Macmillan Press.
- Geanakoplos, J.** (2010). The leverage cycle. In D. Acemoglu, K. Rogoff & M. Woodford (Eds.), *NBER macroeconomic annual 2009* (pp. 1 – 65): Chicago, IL: University of Chicago Press.
- Goldstein, I., Jiang, H. & Ng, D.** (2017). Investor flows and fragility in corporate bond funds. *Journal of Financial Economics*, 126(3), 592 – 613.
- Goodhart, C.A.E. & Perotti, E.** (2015, March). Maturity mismatch stretching: Banking has taken a wrong turn. CEPR Policy Insight 81.
- Gorton, G., Lewellen, S., Metrick, A.** (2012). The safe-asset share. *American Economic Review* 102(3), 101 – 106.

- Gorton, G. & Metrick, A.** (2010, Fall). Regulating the shadow banking system. *Brookings Papers on Economic Activity*, 261 – 312.
- Gruber J. & Kamin, S.** (2015). The corporate saving glut in the aftermath of the global financial crisis. FRB International Finance Discussion Paper No. 1150.
- Hardie, I., Howarth, D., Maxfield, S. & Verdun, A.** (2013). Banks and the false dichotomy in the comparative political economy of finance. *World Politics*, 65(4), 691–728.
- Harris, L.** (2003). *Trading and exchanges: Market microstructure for practitioners*. Oxford: Oxford University Press.
- Illes, A. & Lombardi, M.J.** (2013, September). Interest rate pass-through since the financial crisis. *BIS Quarterly Review*, 57 – 65.
- Ingham, G.** (2006). Further reflections on the ontology of money: Responses to Lapavitsas and Dodd. *Economy and Society*, 35(2), 259 – 278.
- IMF** (2015, October). *Global financial stability report*. Washington, DC: IMF.
- ISDA** (2009). *Margin Survey*. Retrieved from <https://www.isda.org/category/research/surveys/>
- ISDA** (2014, April). *Margin Survey*. Retrieved from <https://www.isda.org/category/research/surveys/>
- ISDA** (2015, August). *Margin survey*. Retrieved from <https://www.isda.org/category/research/surveys/>
- Jacobson, E.** (2009, March 5). Bond funds swimming naked. *Morningstar*. Retrieved from <http://news.morningstar.com/articlenet/article.aspx?id=283045>
- Keynes, J.M.** (1997 [1935]). *The general theory of employment interest and money*. New York, NY: Prometheus.
- King, M.** (2016). *The end of alchemy*. New York, NY: Norton.
- Klee, E. & Stebunovs, V.** (2011, September). A target treasury general collateral repo rate: Is a target repo rate a viable alternative to the target federal funds rate? Federal Reserve Working Paper.
- Kocherlakota, N.** (2014, June 5). Low real interest rates. [Speech]. Federal Reserve Bank of Minneapolis.
- Kocherlakota, N.** (2016, April 27). The world needs more US government debt. *Bloomberg View*. Retrieved from <http://www.bloombergview.com/articles/2016-04-27/the-world-needs-more-u-s-government-debt-narayana-kocherlakota>

- Kotlikoff, L.** (2010). *Jimmy Stewart is dead: Ending the world's ongoing financial plague with limited purpose banking*. Hoboken, NJ: Wiley.
- Krishnamurthy, A., Nagel, S. & Orlov, D.** (2014). Sizing up repo. *Journal of Finance*, 69(6), 2381 – 2417.
- Kwan, S.** (2014, August 4). Long road to normal for bank business lending. FRBSF Economic Letter 2014-23.
- Levine, R.** (2002). Bank-based or market-based financial systems: Which is better? *Journal of Financial Intermediation* 11(4), 398–428.
- Levitin, A.** (2016). Safe banking: Finance and democracy. *University of Chicago Law Review* 83(1), 357 - 455.
- Loeys, J., Makkie, D., Meggyesi, P., & Panigirtzoglou, N.** (2005, June 24). Corporates are driving the global savings glut. London: JP Morgan Research.
- Lysandrou, P.** (2011). Global inequality as one of the root causes of the financial crisis: A suggested explanation. *Economy and Society*, 40(3), 323 – 344.
- Macey, J. & Miller, G.** (1992). Double liability and bank shareholders. *Wake Forest Law Review*, 27, 31 – 62.
- Mackintosh, J.** (2008a, March 7). Gloom set to worsen as threat of spiral grows. *Financial Times*.
- Mackintosh, J.** (2008b, March 19). Endeavor hit by JGB fallout. *Financial Times*. Retrieved from <https://next.ft.com/content/33e859c0-f5e6-11dc-8d3d-000077b07658>
- Mackintosh, J.** (2008c, September 10). The search for a floor in convertibles. *Financial Times*. Retrieved from <http://www.ft.com/cms/s/0/15e0e7ca-7edb-11dd-b1af-000077b07658.html>
- MacKenzie, D.** (2006). *An engine, not a camera*. Cambridge, MA: MIT Press.
- Mehrling, P.** (2011). *New Lombard Street*. Princeton, NJ: Princeton University Press.
- Minsky, H.** (2008 [1986]). *Stabilizing an unstable economy*. New York, NY: McGraw Hill.
- Muniesa, F.** (2014). *The provoked economy: Economic reality and the performative turn*. New York, NY: Routledge.
- Oregon DOJ** (2009, November 20). Oppenheimer Funds agrees to pay Oregon families \$20 million to settle lawsuit alleging college savings plan mismanagement. [Press release]. Retrieved from <http://www.doj.state.or.us/releases/pages/2009/rel111909.aspx>

- Phillips, R.** (1996). The Chicago plan and New Deal banking reform. In D. Papadimitriou (Ed.), *Stability in the financial system* (pp. 94 – 114). New York, NY: Macmillan.
- Piketty, T.** (2013). *Capital in the twenty-first century*. London: Harvard University Press.
- Pitluck, A.Z.** (2011). Distributed execution in illiquid times: An alternative explanation of trading in stock markets. *Economy and Society*, 40(1), 26 – 55.
- Portes, R.** (2007). Comment on A global perspective on external positions. In R. Clarida (Ed.), *G7 current account imbalances: Sustainability and adjustment* (pp. 99 – 102). Chicago, IL: University of Chicago Press.
- Pozsar, Z.** (2014). Shadow banking: A money view. Office of Financial Research Working Paper 14-04.
- Pozsar, Z.** (2015). A macro view of shadow banking: Levered betas and wholesale funding in the context of secular stagnation. INET Working Paper.
- Ricks, M.** (2016). *The money problem: Rethinking financial regulation*. Chicago, IL: University of Chicago Press.
- Riles, A.** (2011). *Collateral knowledge*. Chicago, IL: University of Chicago Press.
- Rodrik, D.** (2015). *Economics rules*. New York, NY: Norton.
- Saguato, P.** (2015). The liquidity dilemma and the repo market: A two-step policy option to address the regulatory void. LSE Law, Society and Economy Working Papers 21/2015.
- Securities and Exchange Commission.** (2018, April 12). Private funds statistics. Report of the Division of Investment Management Risk and Examination Office. Washington, DC: Securities and Exchange Commission.
- Singh, M.** (2011). Velocity of pledged collateral. IMF Working Paper WP/11/256.
- Sissoko, C.** (2003). *On the monetary role of banks*. (Unpublished doctoral dissertation). UCLA, Los Angeles, CA.
- Sissoko, C.** (2007, June). An idealized view of financial intermediation. *Economics: The Open-Access, Open-Assessment E-Journal*, 2007-5.
- Sissoko, C.** (2010). The legal foundations of financial collapse. *Journal of Financial Economic Policy*, 2(1), 5 – 34.
- Sissoko, C.** (2016a). How to stabilize the banking system: Lessons from the pre-1914 London money market. *Financial History Review* 23(1), 1 – 20.
- Sissoko, C.** (2016b). Money is debt. SSRN Working Paper.
- Sissoko, C.** (2017). The plight of modern markets: How universal banking undermines capital markets, *Economic Notes*, 46(1), pp. 53–104.

- Smiley, G. & Keehn, R.** (1988). Margin purchases, brokers' loans, and the bull market of the twenties. *Business and Economic History*, 17, 129 – 141.
- Spears, T.** (forthcoming). Discounting collateral: quants, derivatives and the reconstruction of the 'risk-free rate' after the financial crisis. *Economy & Society*.
- Sunderam, A.** (2015). Money creation and the shadow banking system. *Review of Financial Studies*, 28(4), 939-977.
- Summers, L.** (2014). US economic prospects: Secular stagnation, hysteresis, and the zero lower bound. *Business Economics*, 49(2), 65-73.
- Summers, L.** (2015, April 1). On secular stagnation: Larry Summers responds to Ben Bernanke. [Blog post]. Retrieved from <https://www.brookings.edu/blog/ben-bernanke/2015/04/01/on-secular-stagnation-larry-summers-responds-to-ben-bernanke/>
- Turner, J.** (2014). *Banking in crisis*. Cambridge: Cambridge University Press.
- Wolf, M.** (2013, November 19). Why the future looks sluggish. *Financial Times*. Retrieved from <http://www.ft.com/intl/cms/s/0/a2422ba6-5073-11e3-befe-00144feabdc0.html>
- Wolf, M.** (2014). *The shifts and the shocks: What we've learned – and have still to learn – from the financial crisis*. London: Penguin Books.
- Wray, L.R.** (1990). *Money and credit in capitalist economies: The endogenous money approach*. Cheltenham: Edward Elgar.
- Wray, L.R.** (2015). *Why Minsky matters*. Princeton, NJ: Princeton University Press.

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Notes

¹ Indeed, I have found that the financial system has been deliberately retooled at the behest of the financial industry (Sissoko, 2010; Sissoko, 2017).

² The focus here is on the macroeconomic implications of repos' contractual structure, so other important properties of repo markets, including their capacity to expand the money supply

and the role they may play in financing private sector investment (Gabor & Vestergaard, 2016; Singh, 2011), are not studied here.

³ Riles (2011) documents how market participants built the legal infrastructure supporting these remarkably lender-friendly collateral terms both by lobbying successfully for new statutes and by constructing chains of ‘legal fictions’ or ‘statement[s] that [are] consciously understood to be false’, but that practitioners find useful. She concludes that the growth of the repo market upon this foundation created a new reality as these fictions gained a ‘practical legitimacy’ that was ‘enduring, even at times of crisis’. The use of the term ‘legal fiction’ – a term generally reserved for analytic tools created by courts of law – may, however, give the legal process that Riles describes an unwarranted veneer of respectability.

⁴ This view of financial market stability helps explain Spears’ findings in this volume: derivatives markets were initially founded on the assumption of bank-sourced liquidity – that is, on the ability of dealer banks to borrow and lend at LIBOR – but after the growth of market-based lending had undermined the banking system, this assumption failed and the pricing of derivatives became almost impossibly complex.

⁵ The contradiction is generated by assuming that agents take prices as given while at the same time using their decisions to determine prices: as a result, it is well established that neoclassical market equilibrium is not incentive compatible except when there are very many agents on both sides of every market (Geanakoplos, 1987).

⁶ That economic models can be deconstructed is unsurprising, as a fundamental premise of economics is that “All models are wrong”. A pragmatic approach to this reality is advocated by, for example, Dani Rodrik (2015) who explains that economics is a collection of models and that the practice of economics is the art of navigating between models.

⁷ JPMorgan Chase, through its bank subsidiary, together with its predecessor, Morgan Guaranty, has played such a significant role in the tri-party repo market since the 1990s that it raises doubts as to whether the bank-market dichotomy is meaningful. Consistent with earlier data, in 2007 17 per cent of the bank’s balance sheet funded repos, in 2013 12 per cent, and in March 2016 9 per cent (Call Report data, <https://cdr.ffiec.gov/public/>)

⁸ There is reason to believe that the founders of the Bank of England had as one of their goals stabilization of the money market, and thus that the capacity of the central bank to play this role was part of the design of the Bank of England when it was founded (see Sissoko, 2003, quoting Anderson, 1787).

⁹ ‘Cash pools’ include not only money market mutual funds, but also other funds devoted to near-cash instruments including those managed by corporate treasuries and the liquid assets of funds that invest in longer-term assets (Pozsar, 2015).

¹⁰ Safe unsecured assets include Treasury bills and government-insured deposits.

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- ¹¹ The extension of this approach to other aspects of the modern markets system is left to future work.
- ¹² In fact, repo contracts are very short-term and at every renewal the lender may raise the haircut. This has the effect of making even more dramatic the problem that is explained here using a scenario where the haircut stays constant.
- ¹³ The lender loses money only if the price of the collateral falls so fast that the over-collateralization is insufficient to compensate for the price fall – which implies that the haircut was set too low in the first place. This is a statement about the contractual rights granted by this type of contract, and thus this claim regarding the ‘safety’ of repos is distinct from that in Spears (this volume) where he observes that derivatives counterparties *assumed* that bank counterparties could borrow at the risk-free rate and that unsecured exposures to them were ‘safe.’
- ¹⁴ Indeed, a repo is such a safe asset that in the years prior to the founding of the Federal Reserve, reserves of the US banking system were invested in repo-type loans on equities (Federal Reserve Board of Governors, 1943).
- ¹⁵ 20th century financial history is littered with cases of failed custodians, comparable to MF Global, a brokerage firm which was found when it went bankrupt in 2011 to have misappropriated customer funds.
- ¹⁶ Rehypothecation does not weaken the contractual protection provided to the repo lender. The repo lender has the obligation to return equivalent collateral, not specific collateral, to the borrower. Thus, when a borrower default occurs, giving the lender the right to foreclose on the collateral, the lender has the right to sell equivalent collateral to close out the transaction, and the fact that the specific collateral posted by the borrower is no longer in the possession of the lender is irrelevant.
- ¹⁷ While some tri-party repo data is available, data on the bilateral repo market is extremely thin, so repo’s precise role in the 2007-08 crisis is unclear. For example, a much-cited paper, Krishnamurthy, Nagel, and Orlov (2014) (KNO), claims: ‘Our findings suggest that the run on repo backed by private sector collateral was not central to the collapse of short-term shadow bank funding in aggregate’, but KNO have data only on the tri-party repo market. Their data is consistent with the ‘suggested’ conclusion, but cannot address the crucial question: Were the dealer banks using funds raised on the tri-party repo market against Treasury/Agency collateral (some of which may have been posted to the dealer banks by conservatively managed funds) in order to lend against the collateral of private sector assets – to potentially less conservatively managed funds – on the bilateral repo market? While KNO’s data and discussion are extraordinarily valuable, the paper’s conclusions are overstated when cited as evidence that ‘ABCP was a larger source of short-term financing for the shadow banking system than repo ~~was~~’ (Sunderam, 2015).

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- ¹⁸ The average hedge fund has, however, much higher leverage. Thus, some large hedge funds rely heavily on leverage.
- ¹⁹ Exchange trade funds are investment funds which issue shares that can be traded on the stock market.
- ²⁰ MacKenzie (2006) and Bookstaber (2008) discuss such ‘superportfolio’ effects with respect to the LTCM collapse in 1998. Esposito (2013) emphasizes the performativity inherent in such phenomena and relates them to Keynes’ description of the market as a ‘beauty contest’.
- ²¹ That the highest quality sovereigns are favoured as collateral should not be confused with the claim that repo markets are only used to finance the purchase of sovereign debt. Repo market participants hold portfolios of sovereign debt because of their utility as collateral that can support short positions, derivatives positions, and raise low cost funds to invest in riskier assets. Furthermore, rehypothecation ensures that sovereign debt may support more than its own value of these activities.
- ²² Collateral is posted against a derivatives contract to cover the amount owed on the contract in order to minimize the risk of a default when payment is due. After the 1998 financial crisis regulators increasingly promoted collateralization of derivatives exposures. Thus, while only 30 per cent of OTC derivatives trades were collateralized in 2002, by 2008 65 per cent and by 2013 91 per cent were collateralized (ISDA, 2009; ISDA, 2014).
- ²³ In economics a secular trend is long-lasting and contrasts with cyclical variations. Thus, ‘secular stagnation’ refers to economic underperformance that is enduring and impervious to the forces that would normally generate a cyclical improvement.
- ²⁴ Proposals for transnational European bonds are designed to address the problems created by the separate character of monetary and fiscal authorities in the EU (e.g. Claessens *et al.*, 2012). They have advantages that lie beyond the scope of this paper.
- ²⁵ The phrase ‘market maker of last resort’, is clearly a misnomer: a market maker seeks ‘to discover the prices that produce balanced two-sided order flows’ and does not trade based on an evaluation of the fundamental value of an asset. Those who set a floor on asset prices are the proprietary (or value) traders. See Harris (2003). Thus, this policy proposal should be dubbed the ‘prop trader of last resort’.
- ²⁶ Goodhart & Perotti (2015), King (2016), and Ricks (2016) have more complicated proposals for reform of the banking system.