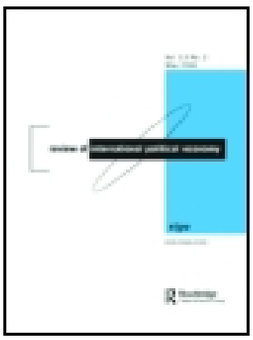

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The (impossible) repo trinity: the political economy of repo markets

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ABSTRACT

In its capacity as debt issuer, the state has played a growing role in financial life over the last 30 years. To examine this role and connect it to shadow banking, the paper develops the concept of the 'repo trinity', which captures a set of policy objectives that central banks outlined after the 1998 Russian crisis, the first systemic crisis of collateral-based finance. The repo trinity connected financial stability with liquid government bond markets and free repo markets. It further reinforced the dominance of the US government bond market as institutional template for states adjusting to a world of independent central banks, market-based financing and global competition for liquidity. Central banks and the Financial Stability Board recognized the impossible nature of the trinity after 2008, attributing cyclical leverage (financial instability) and elusive liquidity in collateral markets to deregulated repo markets, markets systemic to shadow banking. The new approach triggered radical changes in crisis central banking but has not powered significant regulatory interventions in the absence of an alternative mode of organizing government bond markets.

KEYWORDS

shadow banking; repo markets; government debt; liquidity; US Federal Reserve; US Treasury; ECB; Bundesbank; market-maker of last resort.

INTRODUCTION

In a 2005 speech, Tumpell-Gugerell (2005), one of the ECB's Executive Board members, celebrated collateral – marketable securities issued by states or the private sector – as the device that would restore the

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'perfection of financial markets, regardless of the uncertainty and information asymmetry that is prevailing among market participants'. Only six years later, the Financial Stability Board (FSB, 2011, 2012) provided a stark challenge to this view. It proposed that repo markets, markets that circulate collateral, should be included alongside securitization in the shadow banking reform agenda.

Securitization remains the better-understood market. It typically involves the transformation of a pool of illiquid loans into tradable securities. Moving assets off balance sheet provides regulatory and tax benefits for the originating entity. Purchasers of the securities receive the cash flows from the underlying assets, and can use the tradable securities as collateral in wholesale funding markets. Before 2008, regulators applauded the efficiency improving, risk-spreading benefits of securitization (Engelen et al., 2011). Yet tensions in the subprime mortgage market quickly showed that the socio-cultural and interpretative practices involved in the pricing of such complex instruments had not allowed for a world of profound uncertainty (MacKenzie, 2011). Once financial institutions found it impossible to value securitized instruments, and stopped accepting them as collateral (Gorton and Metrick, 2012), securitization came to embody the misleading promises and distorted incentives underpinning financial innovation. It vindicated Minskian analyses of endogenous financial instability (Moe, 2012; Nesvetailova and Palan, 2013).

The repo market has attracted less attention. Repos, or repurchase agreements, involve the sale and repurchase of an asset (collateral). Repos are also known as securities financing transactions. A bank can fund its portfolio of government bonds by selling these in a repo transaction, with a promise to buy them back. For the duration of the repo, the bank remains the economic owner of those government bonds, being exposed to their risk and returns. Furthermore, repos are core to short-selling, allowing financial institutions to borrow securities before selling. The repo market has a bilateral segment where parties lend to each other and a tri-party segment where management of collateral is outsourced to an agent. The global financial crisis showed that instability looks different on these two segments. Lehman Brothers and Bear Sterns lost access to tri-party repo funding (Krishnamurthy, Nagel and Orlov, 2014; Task Force, 2009). The run on bilateral repos manifested through dramatic increases the cost of funding against securitized collateral (Gorton and Metrick, 2012).

Political economy scholars have examined securitization as fertile terrain for theorizing the challenges that shadow banking raises for states' ability to regulate finance (Ban, Seabrooke and Freitas, 2016; Helgadóttir 2016; Kessler and Wilhelm, 2013; Rixen, 2013; Thiemann, 2014). Shadow banking is typically viewed as another (lamentable) outcome of states

captured by the power of big finance or blinded by ideological preference for self-regulating markets. For instance, Sissoko (2010) argues that the 2005 changes in the legal treatment of collateral in the USA played a destabilizing role, allowing private finance to use lower-rated asset-backed securities as collateral while meeting demand for 'yield bearing debt securities required by the global investor community' (Lysandrou and Nesvetailova, 2014; Pozsar, 2011). Yet the possibility that the state's role in shadow banking goes beyond (poorly) setting regulatory perimeters is illustrated by a simple statistic. Government debt collateralizes roughly two thirds of both US and European repo markets, the largest in the world (together amounting to USD 20 trillion by 2008). Indeed, while the scholarship on market-based banking (Hardie et al., 2013) pays little attention to the role that the state, as debt issuer, plays in banks' growing market activities, these statistics suggest that the state has become a collateral factory for shadow banking (Giovannini, 2013) and for big banks' activities in the shadows (Gabor and Ban, 2016).

Shadow banking and sovereign bond markets are inextricably linked. What are the historical processes through which repo markets, with a large footprint in sovereign bond markets, grew systemic to global finance? And what are the implications for the new age of central banking, where financial stability is no longer an appendix to the primary objective of price stability?

In exploring these questions, the paper introduces the concept of the repo trinity. This captures the pre-Lehman consensus in the central banking community that the stability of collateral-based finance requires liquid government bond markets and free (deregulated) repo markets. It traces its emergence to the transition from 'fiscal' to 'monetary' dominance in the 1980s and 1990s (Mabbett and Schelkle, 2015), whereby central banks are freed from the obligation to monetize government debt in order to commit exclusively to price stability (Sargent and Wallace, 1981). While the precise mechanics of the monetary/fiscal separation remain poorly understood in the growing literature on state debt (Dyson, 2014; Hager, 2014; Streeck, 2015) or the literature on central bank independence and unconventional monetary policy (Mabbett and Schelkle, 2015; Moschella and Lombardi, 2016), the separation was by no means simple and never complete. Fiscal and monetary policies remained connected in a borderland mapped onto the 'shadow' repo market. The connection has been strengthened by structural changes in finance that have rendered government bonds core to the functioning of market-based finance and by central banks' use of repos to implement monetary policy, developments that remain analytical blindspots in the political economy scholarship on shadow banking, central banking or market-based banking.

The paper first traces the repo market deregulation project at the heart of states' attempts to find solutions to the loss of fiscal dominance. While the shadow banking literature treats repo markets as wholesale money markets (Claessens et al., 2012; Gabor and Ban, 2016; IMF, 2014; Mehrling et al., 2013; Ricks, 2016), historically the connection to government bond markets played a more important role in shaping its evolution. Since the 1980s, states faced with the increasing competition for international investors embarked on a project of creating modern government bond markets, with modernity understood to mean the structural features of the US government bond market: regular auctions, market-making based on primary dealers and a free repo market (UK Treasury and Bank of England, 1995).

Central banks were at first divided on the benefits of deregulated repo markets. The US Federal Reserve and the Banque de France assumed a catalyst role for the repo-sovereign bond market nexus. In contrast, Bundesbank and Bank of England worried that deregulated repo markets would unleash structural changes in finance that would undermine the conduct of monetary policy and financial stability. In the architecture of the US government bond market, the Bundesbank saw the conditions nurturing short-term, fragile finance. Under intense pressure from the financial industry and Ministries of Finance to accommodate structural changes in financial markets, and the demand it created for government bonds, the two central banks liberalized repo markets by 1997.

After the 1998 Russian crisis, central bankers joined forces to construct an epistemic framework for understanding repo markets. In the Committee on the Global Financial System (CGFS, 1999a, b, c, d), central banks subscribed to the policy goals of the repo trinity, arguing that financial stability in modern financial systems required global safe assets, issued in liquid government markets, 'lubricated' by free repo markets. In so doing, the central banking community recognized that sovereign bonds had become the cornerstone of modern financial markets, used as benchmark for pricing assets (Boy, 2014), for hedging, as collateral in private repo markets and central banks' repo operations. Throughout the 2000s, the trinity was extended to include securitization markets in the USA, while the Euro project galvanized consensus for a European repo trinity. With Lehman's collapse, central banks (CGFS, 2010) and the FSB (2011, 2014) recognized the impossible nature of the repo trinity, attributing cyclical leverage and elusive liquidity in collateral markets, including government bond markets, to deregulated repo markets.

The paper then examines how central banks responded to the demise of the repo trinity after 2008. It does so by connecting shadow banking to paradigms of liquidity creation and monetary/fiscal policy interactions. Shadow banking organizes credit creation around (collateral) market liquidity, investors' belief that assets can be traded without large price changes (Amato and Fantacci, 2013). It demands of (some) states to issue

debt in order to meet demand for collateral, and responds with private innovations (securitization) to shortages of high-quality state debt. Keynes's 'fetish of liquidity' gains systemic proportions, requiring a new mode of crisis central banking. Crises cannot be resolved discursively, as it has become fashionable to argue (see Katzenstein and Nelson, 2013). Rather, the central banking community, with the Bank of England at its forefront, now increasingly accepts that financial stability in shadow banking, or market-based finance, means supporting liquidity in collateral *markets* in times of stress rather than supporting banking *institutions* as in the traditional lender of last resort (LOLR) model (Bank of England, 2015; Gabor, 2014; Mehrling, 2012; Mehrling et al., 2013; Pozsar, 2014). The paper finally argues that crisis support for core markets may appear like, but does not entail a return to, fiscal dominance. Rather, it creates financial dominance – defined by Hannoun (2012) as asymmetric support for falling asset prices – that can only be addressed by direct regulatory interventions such as counter-cyclical collateral rules. The FSB's evolving proposals on repo markets suggest that collateral rules would only be possible once states design alternative models of organizing their debt markets.

A BRIEF INTRODUCTION TO REPOS

Repurchase transactions, or securities financing transactions, typically connect institutions seeking safety with institutions seeking risk (Pozsar, 2014, 2015). A US money market fund (MMF) daily liquidity flows typically leave it with deposits at banks only partly covered by the state guarantee. This is unsecured exposure that would require close, and expensive, monitoring of the bank. The MMF prefers a repo deposit, a promise to pay backed by collateral. The debt relationship between the bank and the MMF is now backed by collateral whose tradability is crucial. The MMF becomes legal owner of collateral in Europe, and enjoys exemption from automatic stay in the USA (Comotto, 2012) and can sell those bonds if the bank defaults to recover its cash. Crucially, economic ownership of collateral remains with the bank, which continues to bear the risks and receive the returns on that security (Gabor and Ban, 2016).

To avoid future losses if forced to sell, the MMF uses haircuts and margining. It applies a haircut, asking for a collateral portfolio higher in market value than the cash loan. It also calculates daily the market value of the collateral portfolio (mark-to-market), and makes margin calls. For example, the bank guaranteed the MMF deposit of USD 100 with USD 105 corporate bonds valued at market prices (5% haircut). If collateral falls in market value to 95, the repo is undercollateralized by USD 10. The MMF calls margin, asking the bank to top up the collateral portfolio with USD 10 new collateral. In a funding repo, the two parties agree on a

set of securities that are equivalent as collateral, known as General Collateral (GC) repo. The bank will deliver USD 10 of any GC collateral.

To understand why repos are described as securities financing transactions, it is important to trace the collateral provided by the bank. These could be securities generated by proprietary trading, or borrowed through securities lending, a variation of repos (see Pozsar, 2015). It could also be collateral that the bank accepted when it made a repo loan to a hedge fund. In this second case, known as matched book repo, the bank 'rents' out its balance sheet, intermediating between hedge funds that need funding and MMFs that have it, but for regulatory or prudential reasons cannot engage directly into a debt relationship with hedge funds. The hedge funds accept this arrangement because economic ownership of collateral assets *always* remains with the ultimate repo borrower in a chain of transactions. In this example, the MMF sends coupon payments on collateral to the bank, which in turn sends these to the hedge fund.

The separation of legal from economic ownership together with collateral risk practices thus match demand for safety (the MMF) with demand for risk (the hedge fund). One party's risk protection is the other party's risk production. Collateral in repos is not simply a device for 'holding back risk', as Riles (2011) discussed in derivative markets, but creates conditions for aggressive risk taking in a world of finance where the elusive boundary between risk protection and risk production becomes increasingly blurred (Zaloom, 2004). This is the world of asset managers (Haldane, 2014), including institutional cash pools (pension funds, insurance companies, treasuries of large multinational companies) and levered portfolio managers. It is also the world of banks with significant footprints in capital markets (Erutrk and Solari, 2007; Hardie et al., 2013).

Indeed, to understand why (European) banking took the turn to market activities described in Hardie et al. (2013), it is important to consider the evolution of the repo trinity (see Figure 1), a set of policy objectives developed since the early 1980s that started with the connection between government debt and repo markets.

THE GOVERNMENT BOND – REPO MARKET LINK

Scholars have long been interested in exploring the epistemic communities organized around central banks. In political economy scholarship, the story of central banking since the 1990s is a story of the rapid and successful diffusion of ideas about the merits of (legal) independence, a collective endeavour quite unprecedented in the history of central banking (Marcussen, 2005). McNamara (2002) notes that independence became embedded in global norms of neoliberal governance as the most effective strategy for anchoring commitment to a low inflation target. It was often

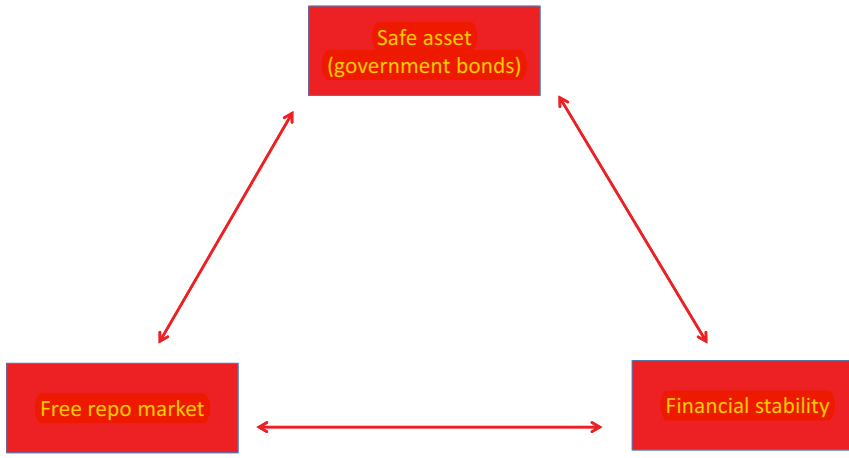

Figure 1 The repo trinity.

imposed through legal obligations generated by EMU commitments, or as part of structural adjustment plans designed by the IMF and the World Bank. In several cases, the UK most notably, the idea of independence became powerful enough to overcome political opposition (King, 2005).

The project of constructing a shared set of normative and causal beliefs about repo markets proved more difficult. It should be understood as a question of the precise mechanics of the separation between monetary and fiscal policy, separation demanded by the monetarist revolution of the 1980s. At that time, Treasuries/Ministries of Finance were rapidly losing their authoritative role in macroeconomic policy management (Hall, 1993). The demise of Keynesian macroeconomics saw a shift in the Treasury's economic mission from aggregate demand management to 'privatisation, labour market reform, and growth policy' that framed growth as a question of 'innovation, infrastructure, deregulation and skills', as Nicholas Macpherson (2013), then permanent secretary to the UK Treasury, described the journey.

With the loss of epistemic authority, Treasuries increasingly accepted the 'monetary science, fiscal alchemy' account of mainstream macroeconomics (Leeper, 2010). That view celebrated the stability benefits of insulating scientific monetary policy, rooted in dynamic stochastic equilibrium models, from poorly theorized, highly politicized fiscal policy. A strict separation also required central banks to step back from state's debt issuance, passing responsibility onto autonomous debt management offices (DMOs). The DMO mandate would entrench the separation. While the DMO would manage debt so as to secure continued market access at lowest cost, it would do so without any concern for broader macroeconomic objectives such as fiscal space, price or financial

stability (Blommestein and Hubig, 2012). States' debt issuance should have no macroeconomic consequences.

Outside the ideational realm increasingly dominated by mainstream economics suspicious of the state's role in economic life, states struggled to adjust to the new regime. While the theory of sovereign debt management reassured that 'professional and predictable' public debt managers would successfully create 'liquid' government bond markets (IMF and World Bank, 2001), the practice proved otherwise. Market-based financing of budget deficits did not see a rapid growth in the 'global' sovereign bond market, as the OECD's (2002) envisaged, because there was nothing global about that market. Rather, it saw an escalating competition for liquidity among states increasingly reliant on markets to address the 'general decline in the taxability of democratic-capitalist societies' (Streeck, 2015). Preparing for competition, states increasingly turned to the US government bond markets.

The US Treasury (UST) market

The symbiotic relationship between the repo market and US sovereign bond market goes back to the Treasury's loss of control over monetary policy in 1951. The Federal Reserve shift emphasis from keeping interest rates low to inflation control. Rising short-term interest rates in the 1970, and rapidly growing Treasury debt after 1974 saw nonbank dealers in government securities seeking cheaper funding from institutional cash managers such as non-financial corporations (Garbade, 2006). The market that would connect the two, inactive since the 1920s, came back to life (see Orian Peer, 2016 for an early history).

Securities financing via repos entailed one important advantage over its sister instrument, secured lending against collateral. The market convention treated repos as outright sale and repurchase of collateral, allowing repo lenders to re-use collateral for their own purposes (short-selling, hedging, selling to a third party).

Market convention was tested twice in 1982. The collapse of Drysdale, a securities dealer, threatened the orderly functioning of the US Treasury market. Several dealers that had lent securities to Drysdale struggled to meet short positions. The New York Fed stepped in, addressing the shortage of US Treasuries by lending from its own portfolio. Yet the Fed could not mitigate the consequences of Lombard-Wall bankruptcy three months later. A bankruptcy court decided that repos would also be subjected to automatic stay rules. Repo lenders could no longer sell collateral to recover the cash lent (Garbade, 2006).

At that point, the US Fed became a catalyst of the government bond – repo market architecture. Together with securities dealers, it started to

lobby Congress to exempt repos from automatic stay. Paul Volcker, the Fed chairman, warned that uncertainties about ownership of repo collateral threatened systemic disruptions and proposed to narrow down exemptions to 'key repo markets in US government and agency securities' in order to accelerate legislation (Garbade, 2006, p.36). By 1984, the strategy proved successful. Congress passed legislation conferring safe harbour to government and agency securities received as repo collateral.

The Salomon Brothers manipulation of the US Treasury market in 1991 proved the next turning point in the repo market-building project. Unlike the two securities dealers described earlier, Salomon Brothers was a primary dealer.

The US primary dealers have two responsibilities: to participate in all auctions of US government debt and to help, as trading counterparties to the US Fed, implement monetary policy decisions. As fiscal agent for the US Treasury, the Fed expects primary dealers to 'bid at every auction, for, at a minimum, an amount of securities representing its pro rata share of the offered amount, based on the number of primary dealers at the time of the auction' (NY Fed, 2016). In exchange for their privileged proximity to the state, for many conducive to regulatory capture (see Dyson, 2014), primary dealers agree to reveal detailed information on securities trading. Since the 1960s, the Fed collects weekly data on their activity (the FR2004), including details on repo funding for each security class (volume repo-ed, counterparty and maturity).

Salomon Brothers tested the limits of this relationship in 1991, when it 'cornered' the market for two-year securities. It bid, on its own account and for its customers, for 90% of all two-year UST issued in May, despite rules that prohibited primary dealers from taking more than 35% of an issue, rules designed to avoid price manipulation. Salomon engineered a shortage of that issue by becoming the only repo supplier of that note for short-sellers. Their demand allowed Salomon to finance its securities through repo transactions 'at exceptionally low' rates.

The public enquiry celebrated repos as a significant innovation in the government bond market, innovation that increased market liquidity. The Joint Report (1991) of the Treasury, the Fed and the Securities and Exchange Commission demonstrated no appetite for regulating repos, despite calls from market participants incensed by Salomon's behaviour. Rather, the Report announced that the US Treasury would pioneer new practices that would 'fix' gaps in the repo plumbing that could be manipulated by ruthless market players. To use Salomon as an example, when the Fed noticed shortages, it would coordinate with the Treasury for the latter to issue additional two-year government bonds without requiring evidence of manipulation. The US Treasury thus chose to become an

active repo market participant to safeguard the liquidity of government bond markets.

The joint Treasury-Fed market-building approach was framed through a narrative of the critical role that repo markets play in the liquidity of government bond markets, thus supporting the state in the post fiscal-dominance era. This approach accommodated, rather than regulated, private repo architectures. It travelled quickly to Europe.

The diffusion of the UST blueprint

In Europe, France was the first to embrace the US market architecture. In the 1980s, France replaced monetary targeting with interest rate management, abandoned credit controls and embarked on rapid financial liberalization (Jabko, 2006). Under the leadership of the Banque de France, France introduced a primary dealership system in the government bond market early in the 1990s. It liberalized repo markets and provided a legal framework for mark to market of collateral and absolute transfer of ownership of collateral. In doing so, it circumvented the safe harbour difficulties that repo market participants encountered in the US. The functional requirements of central bank independence further supported repo market growth. Since the French state could not hold tax revenues with the central bank, the French Treasury placed its cash with banks in repo transactions. By 1993, market participants declared the French government bond market, then second largest in the world, to be 'the most sophisticated of its kind in Europe' (Rosenbaum, 1993).

France's strategy reflected two connected developments. First, France sought to capture the growing repo footprint of global finance. Throughout the 1980s, the European and US (investment) banks with global ambitions became competitors to the securities industry, funding securities positions in repo markets. Their growing market activities also changed international interbank markets. Global banks became increasingly reluctant to extend uncollateralized credit to each other, concerned with exposure to undisclosed proprietary trading. This move to collateral-intensive finance, France calculated, would benefit sovereign issuers who encouraged foreign investors to use their bonds as repo collateral.

Second, the French strategy was also tailored to take advantage of the common currency project in Europe. While the German Deutsche Mark (DM) had dominated – and for France complicated – currency markets in Europe, locking countries in a defacto DM zone, France saw an opportunity in the Euro. By emulating the US government bond market, and luring international investors with deregulated repo markets, it hoped to wrestle the benchmark issuer of government debt in Euro from Germany.

Despite considerable pressures from its international banks, Germany's central bank, the Bundesbank, refused to ease its grip on the repo market until 1996. Bundesbank equated a deregulated repo market with money market volatility. It worried that given the choice, banks would prefer repo funding, thus abandoning the uncollateralized segment where Bundesbank implemented monetary policy. This threatened its money supply targets and the commitment to price stability on which it had built its reputation.

Seeking to keep banks captive on the uncollateralized money market, Bundesbank imposed reserve requirements on banks' repo liabilities. Banks were asked to hold 2% of repo deposits in reserves at Bundesbank, a haircut that increased repo costs. German banks, Deutsche Bank the most vocal, decried their central bank's position:

> 'It's starving us out.' 'It's squeezing us dry.' 'It just doesn't understand our problems.' This is what you'll hear if you ask the average German repo-trader what he thinks of the central bank…."If it weren't for the minimum reserve, we wouldn't have been obliged to go to London with such haste. (Covil, 1996)

In response, banks moved investment activities abroad. The DM interbank repo business migrated to London, where foreign owners holding nearly half of German government bonds sought to escape Bundesbank's control of repos. German corporations who wanted to place cash in short-term repo deposits also turned to London-based firms. By 1996, only a third of DM 30bn repo market was based in Germany, the rest in the UK (Covil, 1996).

The migration of the DM repo market to London further reflected the Bundesbank's approach to German government bonds. Acting as the government's fiscal agent, Bundesbank followed a conservative issuance strategy. In contrast to the US Fed's approach, the Bund market had irregular auctions, concentrated at long maturities, no primary dealer system and repo rules that increased securities financing costs. Market participants described a 'culture of fear' through which Bundesbank ensured adequate demand, and explained that Bundesbank was reluctant to 'police primary dealers…preventing dealers from engaging in arbitrage at the issuer's expense' (Euromoney, 1997).

Bundesbank saw in the US bond market architecture the conditions that nurture fragile finance. Observers interpreted its dismissal of short-term government debt and foreign currency bonds as evidence of its 'disapproval of short-term finance' (McCauley, 1999). As Trampusch (2015) notes, Bundesbank presidents stressed that a sovereign debt management strategy driven by market priorities – and therefore guided by the US institutional blueprint – would have negative

consequences for monetary policy and the macroeconomic environment more generally.

For Bundesbank, the battle over repo markets was not simply a question of its preference for the shape of finance or monetary control. It belonged to the strategic question of the design of the Eurozone's monetary architecture. Its independence from government and credibility had made it into a powerful engine of the epistemic community promoting central bank independence, and a powerful actor in negotiations for the institutional design of EMU (Jabko, 2006; Quaglia, 2008). In those negotiations, Bundesbank pressed for minimum reserve requirements on repos to be central to the policy toolkit of the future European Central Bank. Relaxing its domestic repo requirements would have made it difficult to persuade other central banks – such as Banque de France – with a more benign stance on repo markets.

German banks and institutional investors used states' negotiations over the future shape of EMU to their advantage. Banks increased pressure by stressing the potential trade-off between repo restrictions and Germany's attractiveness as international financial centre. Bundesbank denied that its job was 'to lobby for the Frankfurt financial marketplace' (Covil, 1996). Yet its resistance proved short-lived. Caught between the demands of ever more competitive international markets and the politics of EMU design (Dyson et al., 1995), in particular the aggressive French strategies, Bundesbank stopped opposing the issuance of short-term sovereign debt (McCauley, 1999), and dropped its repo rules by end of 1996.

Indeed, by 1997, Bundesbank was taking seriously the project of making Germany the Euroarea's sovereign benchmark issuer. Citing 'an increasing level of competition between sovereign issuers and between leading financial centres in Europe for the favour of international investors', Bundesbank vice-presidents warned that 'the answer will be determined not only by the financial policies of the countries participating in the monetary union…a much more central role will be played by each nation's debt management' as 'international investors will favour the markets that offer them a complete selection of maturities and sufficient liquidity in each issue' (Euromoney, 1997). Put different, liquidity mattered more than fiscal probity for the benchmark issuer position.

A similar process unfolded in the UK. For 10 years after the 1986 Big Bang, Bank of England resisted pressures for repo liberalization. As agent for the Treasury, Bank of England exercised strict control over the repo gilt market, only allowing a handful of designated institutions – the Gilt Edged Market Markers – to borrow and short gilts. These restrictions made entry difficult for foreign banks and securities houses, who used repos to take (short) positions in securities, including government bond markets. Ease of entry via repo markets concerned some market participants (including GEMMs who wanted to preserve their privileged

access) and the Bank of England. With Black Wednesday fresh on their minds, they feared that 'only international speculators like George Soros, who think they will be able to make money speculating on gilts, will benefit from the introduction of a repo market. They will be able to short gilts without actually buying them' (Kattoulas, 1993).

The UK Treasury disagreed, and its pressure proved crucial. The Treasury – under the control of the Conservatives who strongly opposed central bank independence – saw two issues at stake. A liberalized gilt repo would ease government's funding costs by making gilts attractive to foreigners. This position applauded the entry of foreign investors with short horizons as critical to improving market liquidity and to strengthening the competitive position of the City, at a time when European capitals were rapid liberalizing (Baker, 1999). Citing the US and France as examples of modern sovereign bond markets, the Treasury's (1995) Debt Management Review implicitly agreed with foreign investors that derided Bank of England's tight repo control as evidence of anachronistic thinking.

Following the review, Bank of England agreed to full liberalization. In its first year, repo market activity grew to GBP 100 bn. Bank of England (1997) noted that 'the main impact of introducing a gilt repo market was to enhance the liquidity of the gilt market and hence the attractiveness of gilts'. This went hand in hand with a 'substantial shift from unsecured to secured money markets', with gilt repo accounts accounting for half of all overnight transactions in the sterling money market. What Bundesbank had predicted for German interbank markets was also happening in UK. Although Bank of England initially contemplated prudential capital requirements on institutions with large repo books, it never translated them into policy.

While the independence literature sees Bank of England and Bundesbank as powerful actors (Quaglia, 2008), the politics of repo liberalization suggests a more nuanced picture. Both refused originally to accommodate the sovereign-repo architecture preferred by market participants and Ministries of Finance, out of concerns with monetary policy implementation and financial stability. Only one year after liberalization, these concerns proved justified.

THE REPO TRINITY: BRINING FINANCIAL STABILITY IN

The fragilities of the new, increasingly collateral-based world became immediately apparent. The 1997 East Asian crisis put little systemic pressure on the 'shadow market', as the industry magazine *Euromoney* termed the repo market (Celarier, 1998). Everything changed with the 1998 Russian crisis (Kambhu et al., 2007). The first crisis of repo-based finance, as the global community of central bankers would come to

describe it a year later (CGFS, 1999a, b, c), confirmed that in market-based systems, it is the loss of liquidity in collateral markets that triggers crises, not banks' inability to meet the withdrawal of retail deposits. With the Russian crisis, market liquidity became systemic in modern global finance.

The Russian crisis marked the beginning of a collective effort by the community of central bankers to study – but *not* to regulate – repo markets closer. Central bankers had already joined efforts to study the global ramifications of ever more integrated finance. In 1971, the Euro-currency Standing Committee was set up with a mandate for central banks to monitor international banking activity. In 1999, that group was renamed the CGFS to signal central bankers' interest in examining closely the structural shifts in financial markets and making sense of the Russian crisis. In its first year of activity, the CGFS published four reports that together drew the contours of the repo trinity.

The reports described repo markets as *the* global conduit for uncertainty after the Russian default. The reports examined the contribution that repo markets could make to systemic risk, since repos provided an 'especially cost-effective source of leverage'. Excessive leverage could sharpen the systemic links between repo and collateral markets, since collateral price volatility would lead to under-collateralized repos, margin calls and evaporating market liquidity (CGFS, 1999a, b; Domanski and Neumann, 2001). When securities prices fell, mark-to-market of collateral put pressure on financial institutions funding highly leveraged positions in repo markets. Their attempts to fire sale securities led to an evaporation of liquidity in the markets that supply collateral, further depressing prices. As contagion from the Russian crisis spread, CGFS (1999c) argued, falling prices triggered a 'global margin call', sharpening price volatility and a global flight to liquid assets.

The CGFS (1999c) noted the growing consensus that financial stability in market-based finance required policy makers to identify a *core* market whose liquidity could be 'immune' to. Highly liquid assets with limited price volatility would be used as safe repo collateral, to preserve access to repo funding during periods of market stress, since liquidity meant less frequent margin calls. The reports identified government bond markets as the 'natural' core market, due to their function as benchmark for pricing other assets, as hedging instrument for positions in securities markets and in the implementation of monetary policy. The IMF (2001, p.81) joined in, arguing that 'government securities can be seen as possibly providing public-good benefits – beyond those associate with fiscal policy – by playing a role in financial efficiency and perhaps also in financial stability by facilitating private risk management'.

With this, the central banking community reiterated the desirability of the US institutional structure for government bond markets and quietly

powered the growing importance of state debt as safe asset for financial markets. The CGFS put the repo trinity on the policy agenda: financial stability in modern finance would require core liquid markets, which in turn required free repo markets.

In drawing the contours of the repo trinity, the CGFS reports deployed the arguments pervasive in the German and UK debates on repo liberalization. Fiscal authorities would attract foreign investors and support effective market-making activities of primary dealers if well-functioning repo markets facilitated short-selling. Furthermore, structural demand for repo financing (documented earlier) would increase demand for collateral, and thus contribute to government bond market liquidity. Reports skirted the more complex supply-side questions raised by the observation that 'size breeds liquidity' (IMF, 2001), stressing that governments should not understand the repo trinity as an invitation to increase borrowing in order to promote bond market liquidity. Rather, repo markets would 'lubricate' government bond markets.

The CGFS (1999c, p.11) attributed the crisis to failures to 'appreciate the role of market liquidity in risk management'. Thus, free repo markets with adequate risk management practices could improve financial stability. Despite painting a comprehensive picture of repo-based fragilities, central banks recommended better market self-discipline, defined as a more careful collateral risk management regime. The CGFS called for market participants to introduce initial haircuts that would limit leverage, daily marking to market and prompt margin calls to protect lenders from future volatility in markets for collateral.

A similar process, Pagliari (2013) showed, occurred in derivative markets. Increased scrutiny following crises in the early 1990s generated little regulatory bite, due to the ideological preference for the benefits of self-discipline.

The Russian crisis thus energized further the illusive quest for liquidity. Central banks accepted the assumption that in deeply liquid markets, repo-reliant institutions could always sell collateral without systemic consequences. If the counterparty defaulted, the collateral this provided could be sold immediately. The daily margining practices would ensure that the repo lender would recover her cash loan whatever the direction the collateral market would take. If implemented correctly, repo risk practices would do away with Keynes' predictions about unknowable future prices (Amato and Fantacci, 2013), restoring the lost paradise of perfect information.

IN PURSUIT OF THE REPO TRINITY

In the US, falling levels of government debt complicated the pursuit of the repo trinity as a market-based approach to financial stability. By 2000,

the US government's fiscal tightening led observers to estimate that all public debt would be redeemed by 2012 (IMF, 2001). Fiscal policy decisions threatened the disappearance of the largest 'core' market in the world. In response, the US Treasury and the Fed set to answer the question: what would finance look in a world without US government bonds?

The Fed noted the critical role that sovereign debt played in the conduct of monetary policy and in financial markets (Fleming, 2000). To address a future where it could not buy enough government debt to implement interest rate decisions, the Fed turned to repo loans. Its operational framework for implementing monetary policy was marshalled to help dismantle legal impediments to repo growth, paving the way for extending the automatic stay regime to debt instruments issued by shadow banks. Thus, the Fed decided to expand the range of collateral it accepted in repo operations to include mortgage-backed securities in 1999 (IMF, 2001). With this, the Fed encouraged shadow banking as a process of manufacturing high-quality collateral that could mitigate the growing scarcity of public securities and eventually replace them as the core liquid assets discussed in the CGFS forum.

Behind the scenes, the Treasury joined the Fed. In the suggestively entitled 'Life after Debt' internal document, the Treasury (2000) also noted the growing importance of state debt in financial life, along the lines described by CGFS (1999a, b, c). The document contemplated two potential solutions. One proposed that state debt issuance could be completely divorced from fiscal policy. This approach recognized that the state played a greater role in the economy than the 'monetary science, fiscal alchemy' narrative suggested. The state's debt issuing capacity mattered for capital market activities. The Treasury would continue to issue debt, thus meeting the demands for a core liquid asset.

Yet if debt issuance were to be divorced from fiscal policy altogether, what would the Treasury do with the proceeds of its debt issuance? The obvious solution, buying private assets, set uneasy with a Treasury ideologically committed to market discipline. Issuing debt to then intervene in private credit markets had distributional consequences. Wherever it turned, the Treasury saw traps set in motion by its attempts to maintain the separation between monetary, fiscal and debt management policies.

Without appetite for revolutionizing the institutional architecture, the Treasury decided to trust financial innovation. Private markets would evolve to 'deal with the demise of the US Treasury market' (Treasury, 2000) by providing private alternative instruments of similar liquidity, including securitized financial products. Liquidity would be critical to this substitution, and liquidity required a repo market benefiting from safe harbour exemptions (Fleming, 2000). By 2005, these concerted efforts paid off. The US Congress approved safe harbour exemption to repos with mortgage and asset-backed securities collateral. The repo trinity, the

Fed and the US Treasury assumed, would also hold for securitized financial products.

In Europe, the introduction of the Euro galvanized consensus for a European repo trinity, where a European repo market would support liquidity in securities markets and financial stability. The finance industry journal, *Euromoney*, published articles with titles such as 'Euroland puts its faith in repos', declaring that 'repurchase agreements will be the backbone of the new order after EMU' (Morton, 1999). In another, it cited Alexandre Lamfalussy, former president of the European Monetary Authority (the ECB's precursor), describing the rapid, and desirable, shift in Europe to market-based finance:

> 'We've seen an accelerated move to a market-centric system from the bank-centric system that has tended to prevail in Europe,' Lamfalussy said in London last month. 'I have no doubt that a market-centric system is more efficient, but there's a question whether it is stable.' The key to stability, he concludes, is a liquid and transparent government debt market. (Shirrell, 1999)

It is important to stress that market-based finance in Europe broadly meant market-based banking (Hardie et al., 2013; Gabor and Ban, 2016). As the ECB (2002) explained in one of its first features on financial stability, the banking landscape in Europe was changing rapidly. Since retail deposits could not fund rapid growth, (large) banks increasingly turned to risk-sensitive repo market financing. The ECB thus recognized that the stability of market-based finance rested on the behaviour of a handful of large banks that increasing relied on collateral to fund positions in securities markets.

For the Giovannini Group, group convened by the European Commission, the benefits of integrating national repo markets went beyond bank funding models. A truly European repo market, where collateral and liquidity would move across borders without impediments from distinctive legal, accounting or regulatory regimes, would rapidly accelerate financial integration and in doing so, improve the liquidity of government bond markets, financial stability and the transmission mechanism of monetary policy (Gabor and Ban, 2016; Gabor, 2016). The end game would be the establishment of the euro as a reserve currency to match the dollar (Shirell, 1999).

On the road to reserve currency, integrated repo markets would help address the challenges created by the pre-Euro competition between Germany and France for benchmark status described earlier. It left the smaller EMU states – losing out in a contest where size breeds liquidity (IMF 2001) – with a liquidity conundrum. If exchange rates no longer mattered, investors, including their own banks, would demand liquid German, French or Italian bonds. The squeeze from the Stability Pact and

the Maastricht criteria, market participants predicted, would further exacerbate concerns over liquidity (Eade, 1996). Having preserved fiscal sovereignty, EMU states stood to lose bond market liquidity, a threat that meant higher borrowing costs.

A European repo market provided an elegant solution. If repo markets treated all sovereign bonds issued in Eurozone as equal collateral, Member States with smaller government bond markets would be able to tap the demand for collateral generated by international investors and European banks that were expanding market activities.

The ECB played a catalyst role in the European repo market. BIS research provided the motivation. In order for the euro to compete with the dollar, 'it will need to have an active repurchase market joining the money market to the government bond market. Here the operations of the European System of Central Banks can be counted on to homogenize European repurchase markets' (McCauley, 1999, p.20).

Like the Fed, the ECB used repos to implement monetary policy, in this case to avoid the monetary financing tones attached to outright purchases of government bonds. Thus, the ECB designed its collateral framework with the repo trinity in mind, expecting that its treatment of state debt would provide a powerful signal to private repo markets. The ECB's collateral framework accepted all Euroarea government bonds as equal collateral. Before Lehman, a European bank could borrow from the ECB's repo operations on identical terms whether it used German or Greek government bonds (Gabor and Ban, 2016).

Throughout the 2000s, developments in EMU called into question the assumptions underpinning the repo trinity. One critical episode involved MTS, then the largest interdealer market for Euro-denominated government bonds, an electronic trading platform originally established by the Italian Treasury and privatized in the late 1990s. EuroMTS came under pressure in 2004, when Citigroup took large positions against market-makers. Citi sold EUR 11 bn worth of government bonds (spanning 200 different bonds), pushed prices lower and bought some back later at significant profit. Citigroup inflicted substantive losses on market-makers, and in the process, highlighted the vulnerabilities of the US model of organizing government bond markets, vulnerabilities that had preoccupied Bundesbank in the 1990s.

The 2005 French vote on the European Constitution provided another warning. Market participants invented 'euro-break up' leveraged trades that involved selling low-rated government bonds (Greece) and buying high-rated government bonds (Germany). Repo markets allowed speculators to take positions against weak euro governments. This would be a 'one-way bet' for hedge funds and macro-traders unless the ECB intervened to buy those government bonds and 'crush short-sellers' (Dizard, 2005). Yet the mood in Europe was pushing the ECB in the opposite

direction. The repeated violations of the Growth and Stability Pact led to calls for the ECB to use its collateral framework to sharpen fiscal discipline where the Pact failed. It would do so by raising haircuts on collateral issued by non-compliant states, reducing the attractiveness of that collateral. The ECB rejected these calls, arguing that its repo operations followed market prices because it marked collateral to market and made margin calls like any private repo lender (Gabor and Ban, 2016).

By 2008, euro GC repo portfolios, including the ECB's, treated all euro government bonds as equivalent collateral. Collateral in European repo markets reflected the relative size of EMU state debt markets. French and German government bonds collateralized around 30% of all overall transactions. Italian, Spanish, Greek, Irish and Portuguese government collateral accounted for another 30% (ICMA, 2008). The consensus in the run up to Lehman remained that the combination of free repo markets and liquid government bond markets would preserve financial stability.

DEALING WITH THE IMPOSSIBLE TRINITY: A NEW AGE FOR CENTRAL BANKS

The collapse of the US subprime mortgage market and then of Lehman Brothers confronted central banks with the impossible nature of the repo trinity. First, Bernanke (2008), then recently appointed as governor of the US Fed, questioned the repo-financial stability assumption:

> remarkably, some financial institutions have even experienced pressures in rolling over maturing repurchase agreements (repos). I say 'remarkably' because, until recently, short-term repos had always been regarded as virtually risk-free instruments and thus largely immune to the type of rollover or withdrawal risks associated with short-term unsecured obligations.

In Europe, the Belgian central bank raised concerns about the repo-liquid securities markets assumption. Sudden funding shocks for leveraged (shadow) banks, it argued, can generate sudden stops in collateral markets, eroding market liquidity regardless of the creditworthiness of the asset issuer:

> asset liquidity may no longer depend on the characteristics of the asset itself but rather on whether vulnerable counterparts have substantial positions that need liquidating. (Praet and Herzberg, 2008, p.23)

The newly created FSB (2011, 2012) organized these concerns in the repo markets workstream of its shadow banking reform agenda. It (a)

linked securitization to short-term repo funding, (b) stressed the systemic interconnectedness created by collateral flows (c) linked securities market liquidity to leverage cycles and (d) attributed systemic instability to cyclical repo collateral standards.

The FSB's account alludes to two critical questions raised by the demise of the repo trinity. The first concerns central bank operations directly. What do central banks have to do if the repo trinity does not hold, where free repo markets create financial fragility and are no 'weather-proof' lubricant for government bond markets? The second pertains to a regulatory agenda: what kind of collateral rules are necessary and possible to re-regulate repo markets?

The first question requires a systematic understanding of the macroeconomic implications of collateral-based finance, hinted at in the early debates on repo market liberalization. Repo markets are not solely important for the functioning of government bond markets or financial fragility in collateral-based finance, but for broader questions of money, leverage and credit creation through the shadow banking system, and for the interaction between monetary and fiscal policy, during normal and crisis time (see Table 1).

Table 1 Interactions between monetary/fiscal policies and collateral-based finance

		To collateral-based finance	*From collateral-based finance*
Monetary policy	Normal times	Repo rate targeting Collateral framework	*New money – liquidity and velocity of collateral* *Financial fragility (valuations, leverage, haircuts)*
	Crisis	Procyclical LOLR vs. MMLR (supporting liquidity in collateral markets) Ratio good/bad collateral (QE)	*Liquidity spirals – collateral crises*
Fiscal policy	Normal times	Issuer of collateral for private and central bank repos	*Liquidity for sovereign bond market* *Securitization as response to shortage of government debt*
	Crisis	Financial stability (market liquidity)	*Collateral fragility*
Coordination monetary / fiscal policy			

The textbook paradigm of liquidity and monetary policy starts from a simple model of bank credit creation. In response to demand, banks issue loans. Loans create deposits, banks' promise to pay the borrower that this uses to settle her commitments. Central banks' influence over this relationship banking reflects the special status of its liabilities. When households or businesses move deposits between banks, the receiving bank has to accept a liability (a promise to pay) to the depositor. It does so because the originating bank compensates it by transferring a special asset – reserves issued by the central bank – that serves as means of settlement between banks. This does not imply, as in the traditional money multiplier story, that the central bank can restrain the quantity of reserves it makes available. Whenever it has tried so, interest rates on the interbank market where banks lend and borrow reserves without collateral became highly volatile (McLeay et al., 2014). Rather, central banks aim to influence long-term asset prices and interest rates by targeting the interest rate at which banks lend to each other without collateral, the fed funds rate in the US, EONIA in the euro area and SONIA in the UK.

The rise of repo markets complicates this transmission mechanism, as Bundesbank had anticipated. Repo interest rates are typically lower because of the protection provided by collateral. Furthermore, banks prefer to lend reserves through repo transactions rather than uncollateralized, more so during crisis (Claesens et al., 2012; Klee and Stebunovs, 2011). The standard transmission mechanism may break down because repo rates also reflect conditions in the markets where collateral trades.

Central banks could adopt a repo interest rate as official operational target in monetary policy (Klee and Stebunovs, 2011). Since the repo market includes a wider range of market participants, it would require central banks to expand the range of counterparties beyond banks. Several central banks have done so, stressing that structural changes in finance require a redesign of the operational framework. Thus, Bank of England and the Federal Reserve now deal directly with central clearing counterparties (CCPs), MMFs and broker dealers. The US Fed expects this would help it leave the zero-lower bound, since MMFs have large pools of liquidity that the Fed needs to absorb to enforce higher money market rates (Pozsar, 2015).

Furthermore, central banks' own repo loan practices matter for market-based credit creation. Historically, monetary policy implementation involved outright purchases and sales of government bonds to adjust the supply of bank reserves. But over the last 30 years, in pursuit of the repo trinity, central banks have increasingly replaced outright interventions with repo transactions. Somewhat paradoxically, central banks' target the uncollateralized interest rate with collateralized interventions in repo markets. In doing so, the terms on which central banks lend reserves – their own repo collateral framework – gains systemic relevance. Since all

central banks have adopted market practices for collateral risk management (haircuts, mark-to-market, margin calls), their collateral framework essentially contains the same pro-cyclical pressures that can be observed in private repo markets (Gabor and Ban, 2016; Plantin, Shapra, and Shin, 2008).

Thus, in a financial system where balance sheets are continuously marked to market, demand for leverage that pushes asset prices up lowers the cost of funding those assets through repos. Repo borrowers make margin calls, receiving back collateral that can be further used to expand balance sheets (Adrian and Shin, 2010). While repo interest rates and haircuts remain below the expected return on the repo-ed assets, (shadow) banks can increase leverage.

Government bonds play an important role in this model of liquidity and credit creation, as the Federal Reserve hinted in the early 2000s (Fleming, 2000). Funding (GC) repos typically use government bonds, reflecting preferential regulatory treatment and cost considerations (Giovannini, 2013). Collateral that trades in liquid markets experiences less price volatility, and is cheaper to fund less liquid securities. Haircuts are lower and margin calls (following mark-to-market) less frequent. Thus, sovereign bond collateral can be re-used (re-hypothecated), as the bank did in the matched book repo example outlined earlier. Before Lehman, only the USA imposed limits on prime brokers' re-hypothecation, to the equivalent of 140% of the client's liability to the prime broker. According to Singh's (2011) estimations of collateral velocity, a high-quality asset typically sustained at least three different repos before 2008, generating 'dynamic collateral chains' (European Commission, 2012).

The preference for sovereign collateral implies that shadow banking, like traditional banking, involves state-facilitated creation of monetary liabilities (Gabor and Vestergaard 2016). The more repo transactions sovereign collateral supports, the higher its velocity, the more leverage-driven asset market liquidity it generates and the more lending via capital markets it supports. Treasuries can do for market-based finance what the central bank does for bank-based finance, creating the 'base asset' that supports the growth of shadow liabilities (Pozsar, 2015). The state, in its debt issuing capacity, becomes a 'shadow central bank' (Gabor and Vestergaard, 2016).

With zero haircuts on government bonds and no limits on reuse, it is tempting to infer that there can be infinite credit creation (and leverage) on government collateral. Yet in practice the segmentation along bilateral and tri-party segments, the operational obstacles for clearing collateral across different trading platforms and the US limits on broker-dealer re-hypothecation reduce collateral velocity significantly. Given that Treasuries do not have a mandate for managing sovereign debt as base asset, it is plausible that the supply of government debt will not meet demand

for either safety or leverage. Foreign official demand for Treasuries (from say China) may also reduce the availability of government collateral if foreign owners do not lend these in repo transactions (Pozsar, 2015). Thus, a demand-side account of shadow banking views securitization as a market response to the shortage of low risk 'repo-able' government debt (Pozsar, 2011), as the Fed had envisaged in the early 2000s (Fleming, 2000). Credit enhancement through tranching and derivatives turns high-haircut assets into low haircut assets, such as the AAA tranches of securitized products (Mehrling et al., 2013).

Shadow banking organizes credit creation around market liquidity. Its fragilities, as CGFS noted in 1999, are distinctive. In traditional banking, liquidity is typically understood to mean funding liquidity, that is, banks' ability to borrow in the (interbank) market to fund assets and meet obligations. In crisis, banks' funding liquidity becomes scarce as depositors wish to cash in their claims and banks become reluctant to lend reserves on the interbank market. Central banks preserve the credibility of commercial banks' promises to pay (bank deposits) by providing LOLR funding liquidity in the form of reserves or cash. It is the injection of reserves — means of settlement between banks — that stabilizes traditional banking.

Shadow banking fragilities arise from illusive market liquidity. Unlike base money issued by the central bank, private 'base' assets such as mortgage-backed securities can quickly loose liquidity in crisis (Singh and Stella, 2012; Gourinchas and Jeanne, 2012). The interaction between market and funding liquidity give rise to haircut and liquidity spirals (Brunnermeier and Pedersen, 2009). Indeed, Gorton and Metrick (2012) show how Lehman's collapse ignited a run in the bilateral repo market. Repo lenders hiked haircuts on asset backed securities from zero to 100% within a few days in September 2008, triggering fire sales, abrupt liquidity stops and a rapid flight to US government bonds. In the tri-party segment, haircuts remained stable but cash providers refused to roll over short-term repos. In Europe, repo market participants stopped accepting collateral issued by governments of Portugal, Greece and Ireland by 2010, while the share of Italian and Spanish sovereign collateral fell rapidly until Draghi promised to do whatever it takes in 2012 (Blyth, 2013, Gabor and Ban, 2016).

The European sovereign debt crisis questions claims that some debt securities remain information insensitive in all states of a financial cycle (Gorton and Ordoñez, 2014). It reminds us of the Keynesian idea that fundamental uncertainty in future asset prices and liquidity illusion applies to both private and public assets (Kirshner, 2009). Crises in shadow banking, where risks show 'on market-to-market balance sheets every day' (Haldane, 2014), manifest as crises of collateral liquidity.

Indeed, there are early signs that Ministries of Finance have started to question the liquidity promises of the repo trinity. In the first worldwide

survey of the relationship between debt managers and repo markets, the Italian Treasury stressed its view that repo markets can destabilize government bond markets (Cannatta, 2012). Similarly, the 2013 Public Debt Management conference organized by the IMF and the US Treasury noted the illusive liquidity of government bonds in their role as 'quasi-money, collateral, hedging instrument'. The BIS called for a better understanding of the macroeconomic implications of public debt (Blommestein and Turner, 2012).

The systemic role of market liquidity renders the LOLR function *destabilizing* for shadow banking. LOLR sits uneasily in discourses of central bank independence, since it involves a decision to support illiquid, possibly insolvent, commercial banks. The independence literature suggests that Bagehot's rule can solve this dilemma, as central banks lend freely, at high rates and against good collateral (Grossman and Rockoff, 2015). By these standards, the literature on the central banking in crisis suggests (Braun 2015, Mabbett and Schelkle, 2015), large central banks have been more generous than Bagehot would have advised. The ECB in particular lent at low interest rates, against low-quality collateral and at long maturities after 2008.

This interpretation disregards the recent evolution of LOLR. Bagehot defined good collateral 'what in ordinary times is reckoned as good security rather than attending to current market valuations' (Moe 2012; Mehrling et al., 2013). In other words, central banks' valuations of collateral accepted under LOLR should support, rather than follow current market prices. But where LOLR is implemented through repos with full risk management regime (mark to market, haircuts, margin calls), then the collateral framework can easily turn procyclical. When falling asset prices prompt central banks to call margin on (unconventional) repo loans, as the ECB did throughout the crisis (Gabor and Ban, 2016), they effectively tighten funding conditions for banks who borrowed via long-term refinancing operations (LTROs) precisely because they could not access private funding markets. A tightening of the central bank's collateral framework, Bindseil (2013) recognized, 'can destabilize the short-term liabilities of banks'.

A quiet revolution in crisis central banking has dealt with the LOLR shortcomings. Central banks have gradually embraced a market-maker of last resort function. At the forefront of institutional innovations, Bank of England (2015) formalized the market-maker of last resort role in its 2015 changes to the Red Book, just as it was the first institution in the world to consistently implement LOLR (Grossman and Rockoff, 2015).

MMLR involves direct interventions in core collateral markets to support market liquidity (Bank of England, 2015). Backstopping core markets requires central banks to set a floor on asset prices, since 'what cash an institution can borrow in repo markets depends on the current market

value of the collateral it posts' (Mehrling et al., 2013). The lower the price, the less collateralized funding. This encapsulates the structural drivers of financial dominance, whereby central banks intervene to stop prices from falling in bad times, but do not prevent prices from rising.

Market-making of last resort, as understood by the Bank of England and the US Fed, can take the form of collateral swaps or asset purchases. Thus, the Securities Lending Facility (in UK) and the Terms Securities Lending Program (US Fed), introduced in early 2008 and unwound by 2011, saw central banks offer Treasury debt in exchange for illiquid securitization instruments (mostly mortgage-backed securities). This upgrading of collateral allowed (shadow) banks to tap repo markets with high-quality collateral. Both schemes involved close coordination with the Treasury and DMOs, that issued Treasury bills in order to meet the shortage of high-quality collateral. Effective coordination between central banks and Treasuries restored the collateral quality of securitized debt instruments.

In contrast to collateral swaps, the direct purchases (including QE) programs have less of a clear-cut impact on collateral availability. Large purchases of government bonds withdraw good collateral from circulation, replacing it with bank reserves that cannot be held by non-bank financial institutions. To address this challenge, central banks can lend their portfolios of government bonds to market participants, and thus 'sterilise' the QE impact on the supply of government bonds.

The ECB's Outright Monetary Transactions (OMT) program also belongs to the MMLR toolkit. It is a (conditional) commitment to stop government bond prices from falling, a commitment to (sovereign debt) market liquidity. Its timing – the threat that the Italian government bond market would implode (Gabor and Ban, 2016) – points to a fundamental contradiction at the core of the MMLR model: backstopping core markets can easily be mistaken for fiscal dominance, as the several German members of the ECB board argued when resigning after 2008. Yet in a system of credit claims built on a base asset issued by government, the distinction between fiscal and monetary dominance becomes increasingly blurred.

Shadow banking, fiscal and financial dominance

Central banks' response to the demise of the repo trinity renders important the question of financial dominance (Hannoun, 2012). While MMLR does not mark a full return to the days of fiscal dominance, it does entail an asymmetric commitment to prevent prices on state and private debt from falling too far too fast. Rather than 'cleaning up' the instability created by cyclical repo markets through MMLR interventions, and thus increase moral hazard, regulators could instead create collateral rules that would lean against leverage cycles funded in repo markets.

The FSB (2012) framework for regulating repo markets took a step in that direction. It proposed universal margin requirements (haircuts) in repo markets that would 'reduce the cycle of excessive borrowing in economic booms that cannot be sustained when liquidity dissipates in core fixed-income markets' (Carney, 2014). Critically, the FSB proposals would apply across all types of collateral, including government bonds. With this, the FSB formally outlined the epistemic framework to justify regulatory interventions in repo markets, recognizing that to control liquidity at a macro-level, one needed to control collateral.

For some, proposals to increase repo costs through minimum haircuts did not go far enough. The FSB could have asked countries to reverse the legal protection afforded to certain types of collateral or restricted the assets that can be used as collateral (Acharya and Oncu, 2010). Nevertheless, targeting repo markets was innovative in macroprudential terms. It shifted regulatory focus to markets, beyond the traditional concern with institutions that saw Basel III include (some) restrictions on banks' use of repos in the new liquidity and leverage rules. Jeremy Stein (2013), then of the US Fed, argued that market-targeting tools would mitigate the systemic consequences of fire-sales without leaving much room for regulatory arbitrage. Any financial intermediary active in the repo market would have to implement it.

In 2012, the FSB put forward two approaches for setting numerical floors on haircuts: a high level and a backstop level (Table 2). Both differentiated across the issuer and residual maturity of collateral. That the FSB assigned government bonds low haircuts suggests that rules for

Table 2 Haircut levels, FSB proposals

	2012 Haircut level (backstop level in parenthesis) vs. **2014** (levels in bold)		
Residual maturity of collateral	*Sovereign*	*Corporate and other issuers*	*Securitized products*
≤1 year debt securities, and FRNs	0.5% (0.25%) – **0%**	1% (.5%) – **0.5%**	2% (1%) – **1%**
>1 year ≤ 5 years debt securities	2% (1%) – **0%**	4% (2%) – **1.5%**	8% (4%) – **4%**
> 5 years; <10 debt securities	4% (2%) – **0%**	8% (4%) – **3%**	16% (8%) – **6%**
> 10 years debt securities	4% (2%) – **0%**	8% (4%) – **4%**	16% (8%) – **7%**
Main index equities		15% (7.5%) – **6%**	
Other assets		25% (12.5%) – **10%**	

governing collateral were designed with specific concerns about preserving government bond market liquidity. Had the FSB been guided by concerns about repo-fuelled leverage, it would have set higher haircuts on short-term government bond collateral, the 'cheapest' collateral for repo-reliant financial institutions.

As most ambitious regulatory initiatives negotiated at global level, these recommendations were considerably watered down (Helleiner, 2010). The FSB (2014) dropped both collateral issued by governments and repos between banks from the scope of its collateral rules. In doing so, it replaced the innovative market-based approach with an institution-based approach *a la* Basel III. One explanation may be that Ministries of Finance involved in the FSB mounted a heavy resistance to the regulation of government collateral just as they opposed the plans to tax repos in Europe (Gabor, 2016), worried, as they had been for the past 30 years, that the liquidity of their debt markets would suffer. Outside the FSB, the European Systemic Risk Board (ESRB 2015) proposals in 2015 to impose countercyclical haircuts and margins for SFT and derivative markets remain the only significant attempts to create rules for the entire collateral universe.

The evolution of the FSB regulatory agenda on repo markets suggests that financial dominance bites hard for states. It captures the threat to the states' ability to regulate, or support the regulation of repo markets by central banks, because of the constraints imposed by a model of organizing government bond markets that is reliant on repo markets. Without coordination with the central bank, and an explicit acceptance that fiscal dominance is no longer analytically useful to conceptualize the relationship between central banks and government debt markets in modern finance, the impossible repo trinity will continue to dominate policy deliberations on repo market reform.

CONCLUSION

In her book on the relationship between finance and the state, Greta Krippner (2011) observed that the state played an important, if contingent, role in creating the conditions for the relentless rise of finance since the late 1970s. Moreover, this paper shows, as the state withdrew from economic life, privatizing state-owned enterprises and state banks, and putting macroeconomic governance in the hands of independent central banks, its role in financial life grew bigger. Sovereign debt has become the cornerstone of modern financial systems, used as benchmark for pricing assets, to hedge positions in fixed income markets and as collateral for credit creation via shadow banking. The state's involvement, passive and systemic at once, has been reliant, beyond the arithmetic of budget deficits, on the intricate workings of the repo trinity.

The turn to finance has created a new set of complex economic and political dilemmas for the state, dilemmas shaped and sharpened by the rise of shadow banking. Away from images of a dark, unregulated sector, shadow banking is fundamentally anchored in government debt markets, anchoring that has generated an organic embeddedness between state institutions with different, and potentially conflicting objectives, and financial markets. So far, we have seen central banks accepting their role as market-makers, including for government bond markets, but only as last resort, and in the Euro area, with heavy fiscal conditionality attached. Yet this may change since central banks' attempt to grapple with shadow banking and its liquidity challenges have created, by 2015, an environment where half of the world's high-quality government debt trades at negative yields.

If and when the 'liquidity storms' triggered by tighter monetary policy, to use Mark Carney's words,[1] will materialize, the terms of the state's relationship with finance will be redefined more radically than in the first global crisis of shadow banking. For scholars of crisis to understand and explain the intricacies and fragilities of shadow banking, it is important to dedicate closer attention to the politics of central banks' collateral framework and market-makers of last resort, to the growing ideational efforts of Treasuries around the world to redefined their role in shadow banking, and to the lobbying strategies of private finance. Scholars could explore the global politics of repo reform by focusing on the internal workings of the FSB where central banks and Ministries of Finance negotiate repo rules, in order to further theorize the political economy obstacles that go to the heart of the governance of market-based finance.

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NOTE

1. http://www.telegraph.co.uk/finance/mark-carney/11367570/Mark-Carney-warns-of-liquidity-storm-as global-currency-system-turns-upside-down.html.

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