

How to exit unconventional monetary policies: a return to the Great Moderation model of central banking?

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ABSTRACT: This paper scrutinizes the exit narratives that portray the ‘normalization’ of central banking as an immediate imperative because a monetary policy conducted in independence from political or market pressure is the only way to avoid inflation, future financial instability or moral hazard. It traces the origins of this narrative to the Great Moderation model of central banking and its two neutrality principles: neutrality from fiscal policy decisions and neutrality from financial markets. It argues that the process of redrawing pre-crisis boundaries is more complicated than it would appear because sovereign and private debt markets have become inextricably connected through the practices of collateralized finance. It lastly outlines the challenges that collateral-based finance raise for re-conceptualizing central banking during normal times.

Introduction

The collapse of Lehman Brothers introduced an unprecedented degree of uncertainty in the conduct of monetary policy, until then widely applauded for successfully overseeing the period of macroeconomic stability between the mid-80s to late 2000s known as the Great Moderation. It confronted central banks with the challenges of abandoning the pre-crisis orthodoxy underpinned by the neat world of New Keynesian models and take instead a more interventionist, overtly political role in financial markets and in relationship to fiscal policy. The interventions that modify the size and/or the composition of the central bank's balance sheet through large-scale asset purchases or liquidity injections are known as balance sheet policy (or liquidity policies), distinct from the dominant interest rate policy that characterized the pre-crisis model of central banking.

The Great Moderation model of central banking portrayed monetary policy as a scientific exercise of setting interest rates in order to deliver price stability (Clarida et al, 1999). It established two axes of neutrality that shaped the institutional set-up for macroeconomic management in high-income countries: central bank neutrality from fiscal policy decisions and neutrality from financial markets. Indeed, central bank independence enshrined the idea that monetary policy should be protected from political interference and sovereign debt management. Furthermore, scholarship argued that the absence of a rules-based framework for conducting fiscal policy may hinder economic stability and called for further depoliticization of fiscal policy (by establishing clear scientific foundations), and until that was achieved, for a fiscally conservative stance to allow central banks to pursue, unhindered, price stability (Leeper, 2010). Second, the principle of market neutrality in the conduct of monetary policy dictated that central banks should not intervene in more than one financial market in order to implement interest rate decisions. The influence over *one* price, the short-term interest rate, on *one* market, the uncollateralized interbank market, would be transmitted to asset prices and long-term interest rates through arbitrage and expectations. In other words, efficient financial markets would do the work for central banks if expectations of short-term interest rates were firmly anchored.

Lehman's failure radically undermined this double de-politicization of central banking and the institutional framework it supported. It first saw central banks abandoning the principle of market neutrality once outright purchases of private assets or relaxed collateral policies (in the ECB's case) were adopted. With the generalized shift to quantitative easing that involved purchases of government bonds, central banks could no longer pretend that monetary policy could be conducted in separation from fiscal policy (Moessner and Turner, 2012). Yet the move into the unknown has not triggered a paradigmatic shift in how central banks or mainstream academia conceptualize the monetary policy or its hegemonic position in the macroeconomic management toolkit. Indeed, although scholarship has initiated a theoretical reflection on how and why the Great Moderation model of central banking failed to address the sources of financial instability and the lessons that can be learnt (witness the rapid ascendance of macroprudential policies), central banks have continuously emphasized the importance of

a timely ‘exit’ from or ‘unwinding’ extraordinary measures. The ‘normalization’ of central banking is important, it is argued, precisely because a monetary policy conducted in independence from political or market pressure is the only way to avoid inflation, future financial instability or moral hazard.

On close scrutiny, the process of redrawing the pre-crisis boundaries is more complicated than it would appear. What makes it difficult, this paper will argue, is that sovereign and private debt markets have become inextricably connected through the practices of collateralized finance. The paper first documents the key issues addressed in the exit literature around timing, pace and sequencing. It then asks how a collateral lens allows us to understand the exit policy dilemmas in the context of a collateral-based financial system and the ongoing attempts to ‘normalize’ central banking.

Narratives of exit: ‘normalizing’ balance sheets and returning to interest rate policy

The literature typically invokes several reasons for unwinding extraordinary crisis interventions: concerns with inflation, financial instability and moral hazard (Belke, 2011; Yamaoka and Syed, 2011). Thus, the large injections of bank reserves through balance sheet policies may have adverse effects on aggregate demand and inflation along the monetarist idea that inflation is always and everywhere a monetary phenomenon, particularly where it monetizes government debt (as QE policies have). From an expectations angle, balance sheet policies can have short-run effects on growth without triggering inflation only if inflationary expectations are managed through a credible commitment to downsize balance sheets and return to ‘normal policy making’ (Anderson et al, 2010). Uncertainty about future inflation fundamentally undermines the New Keynesian transmission mechanism that relies on well-anchored expectations towards the path of the short-term interest rate (Trichet, 2009). Similarly, the key role that global banks play in the intermediation of capital flows may translate aggressive liquidity injections into an increasing willingness to engage into cross-border pursuit of yield differentials (Rajan, 2005) and excessive risk taking, with deleterious spillovers for financial stability in target countries (Caruana, 2011; Gabor, 2012b) particularly given the well-documented link between abundant liquidity and leverage (Bruno and Shin, 2012). Thirdly, collateral policies that allow private financial institutions to park illiquid or low quality assets with the central bank in return for CB liquidity contribute to moral hazard because it reinforces expectations that central banks will be willing to step in again and mitigate the private losses associated with rapid financial innovation.

Exit is thus defined as a ‘return to conducting central banking in a market neutral manner’ (Zorn and Garcia, 2011), that is to re-instating the short-term interest rate as the key policy instrument and the two neutrality principles underpinning the pre-crisis model of central banking. Yamaoka and Syed (2010) list several steps central banks have to resolve as part of an exit strategy:

- (a) **Timing of the exit:** deciding when extraordinary interventions achieved their goal
- (b) **Pace of normalization:** how to downsize the balance sheet
- (c) **Sequencing:** interest rate rises before ‘normalized’ balance sheets?

The seemingly straightforward nature of these steps is in fact misleading: in practice implementation is difficult in the absence of a theoretical framework to guide central banks' understanding of the impact of balance sheet policies that are not subordinated to interest rate policies (Cecioni et al, 2011). For instance, the ECB (Trichet, 2009) advocated a two-pronged exit strategy that tailors interest rate decisions to its assessment of risks to price stability and balance sheet policies to financial stability and market functioning. In contrast, the US Fed's Plosser (2012) points to the discretionary nature of balance sheet policies that opens the door for sustained political or market pressures to intervene in the allocation of resources. In this account, the depoliticization of central banking is necessary to comply with the price stability mandate and can only be achieved by returning to a model of central banking governed by the two neutrality principles: from markets and from governments.

A general view is taking shape, that until balance sheet policies can rely on well established theoretical foundations, they should be used only in extraordinary circumstances to treat adverse developments in financial markets; and that a well-balanced, carefully considered mix of monetary (interest rate) policy targeting price stability and macroprudential policies targeting the build-up of systemic risk through private financial activities (Galati and Moessner, 2011) can successfully mitigate the future imbalances in capitalism. The next sections discuss the challenges of returning to the institutional framework contoured through the Great Moderation model of central banking.

The Great Moderation model of central banking

In the Great Moderation model, central banks operated under a narrow remit: to achieve price stability. Despite this narrow remit, central banks were portrayed as the most important institutions in the institutional framework underpinning macroeconomic management (Gabor, 2010). Indeed, the efficient market hypothesis that guided mainstream narratives of macroeconomic management engendered the promise that price stability would deliver macroeconomic and financial stability while problems of redistribution were best addressed through fiscal policy. At the core of the hegemony of central banks in Great Moderation institutional frameworks laid two distinctive promises: the promise of market neutrality and of political neutrality (in the sense of independence from governments).

The theoretical case for a clear and strict separation between monetary and fiscal policies rested on demonstrating how attempts to coordination may have adverse consequences for macroeconomic stability by distorting the system of incentives that govern (fiscal) policy-making. First, the literature recognized that the objectives of monetary and fiscal policies may overlap, producing externalities and spillovers that rendered the question of coordination a valid theoretical pursuit (Issing, 2002). But New Keynesian research quickly dismissed the benefits, instead arguing that coordination with fiscal policies would be harmful because it confused accountability and transparency, engendering a

form of moral hazard through the implicit endorsement of fiscal authorities' well-documented tendency to prefer short-run political gains. The central bank's involvement in the fiscal domain undermined fiscal discipline (Alesina et al, 2001)¹, particularly in monetary unions without common fiscal authorities (Issing, 2002). Even where sympathetic accounts accepted that the problematic assumptions of the Ricardian Equivalence rendered fiscal policy more potent than assumed in Great Moderation models, the divergent pace of theoretical innovation drove a further wedge between monetary and fiscal policy analysis: whereas New Keynesianism made claims to science by incorporating dynamics, expectations and micro-foundations into models of monetary policy (Clarida et al, 1999), research on fiscal policy retained the old Keynesian concerns (and the overt politicization) with fiscal multipliers, prompting Leeper (2010) to contrast 'monetary science' with 'fiscal alchemy' and to lament the lack of a scientific approach that would isolate fiscal decisions from political cycles. The distinction between 'goal-dependence' and 'instrument independence' was invoked to deflect criticism about lack of accountability (Mishkin, 2007), but also to reinforce the legitimacy of a narrow mandate of price stability that absolved central banks from achieving economic goals beyond price stability in line with the normativity of long-term money neutrality.

Neutrality towards financial markets constituted the second promise, and governance principle, of the Great Moderation model of central banking. According to the market neutrality principle, central banks only intervene in one market segment, the interbank market where banks trade liquidity with each other without the security of collateral, and only to steer short-term interest rates in line with model-derived projections about the path of the short-term interest rate consistent with the inflation target. This separation between the formulation and implementation establishes that balance sheet policies (i.e. direct market interventions) must be subordinated to interest rate policy. The idea that central banks need not go beyond the manipulation of short-term interbank interest rates and credibly anchoring expectations about its future path fundamentally relies on the efficient market hypothesis: 'the details of financial intermediation are irrelevant', as Blanchard et al (2010) put it, because interventions are (a) *redundant*, since arbitrage links short-term to long-term interest rates and (b) *ineffective*, as assets are perfectly substitutable, any interventions in private or government asset markets will fail to affect yields (Eggertson and Woodford, 2003). Central bank intervention in financial markets cannot have distributive consequences (Cecioni et al., 2010). Put differently, direct market interventions should not be tailored to any financial stability concerns because central banks cannot 'make' or 'move' markets, while the open market operations through which the central bank implements policy decisions - lending against collateral - will have no consequences for collateral markets (Zampolli, 2012). For this reason, the financial stability concerns of the central bank were typically framed through interest rate

¹ Alesina *et al.* (2001, p. 6): 'If the monetary and fiscal authorities "keep their houses in order" acting on their own, there is no need for explicit co-ordination. If the fiscal authorities deviate from "prudent" fiscal policies because of a variety of short-run political incentives and constraints, then explicit co-ordination may even be counterproductive'.

decisions in narratives of ‘lean vs clean’ (Gabor, 2010), with the dominant (Greenspan put) view that cleaning after an asset bubble was far easier than preventing them with ‘blunt’ interest rate changes that could not be targeted to the specific sector deemed to be overheating. Furthermore, particularly in developing countries, central banks often resorted to interventions in foreign currency markets even when formally committed to full exchange rate flexibility, a ‘fear of floating’ attributed to the volatility in exchange rates associated with free capital flows and the well-established link between overvalued exchange rates and consumption-driven, credit financed growth regimes (Gala, 2009). Yet these interventions were typically sterilized in order to delink currency interventions from money market liquidity.

In sum, the Great Moderation model of central banking, and the institutional architecture it shaped, engendered what Mann (2010) termed a ‘discursive ambivalence’: it proclaimed the hegemony of monetary policy in the macroeconomic management toolkit while simultaneously positing that essential to this successful management was a careful observance of the principles of neutrality from both fiscal policy/sovereign debt management and financial markets. A first indication that this position was becoming untenable came from the literature on the risk-taking channel (Adrian and Shin, 2007; Gambacorta, 2009) that observed the following: low interest rates, the measure of central banks’ success in maintaining price stability, were in fact contributing to the build-up of financial instability by encouraging search for yield (Rajan, 2005) through cross-border capital flows (also known as carry-trades) and providing perverse incentives for financial institutions’ willingness to take risky positions because of increased confidence in the possibility to roll-over short-term debt.

Abandoning and re-claiming neutrality

The collapse of Lehman Brothers forced central banks to depart from both principles of neutrality.

In the traditional model of financial intermediation, a financial crisis did not necessarily involve abandoning the market neutrality principle. The immediate effect of a financial crisis is to increase the preference for holding highly liquid assets – the most liquid of which is money – in order to preserve funding liquidity, that is banks’ ability to meet liabilities or settle positions (BIS, 2008). The increased liquidity preference translates into higher interest rate on the market where banks trade reserves – the interbank market - moving interbank rates away from the official policy rate. The central bank is the only institution that can mitigate the systemic risk associated with funding liquidity problems because it has (theoretically unrestricted) monopoly power to issue the most liquid asset - bank reserves (under the lender of last resort facility, against quality collateral, De Long, 2012) - until the preference for liquidity normalizes. Liquidity policies would be thus conducted in the usual manner, to realign interbank interest rates with the policy

rate², as most central banks did in the aftermath of the collapse in the subprime mortgage market in August 2007. Thus the central bank's ability to address adverse funding conditions in the interbank market rests on its position as monopoly supplier of bank reserves.

Once the Lehman failure triggered a wide-spread freezing of private credit markets (particularly asset-backed securities), large central banks went much further. With interest rates rapidly brought down to the lower (zero bound) and ample evidence that the 'normal' transmission mechanism would not be restored by the traditional lender of last resort liquidity provision (already in place on a large scale throughout early 2008), central banks became market-makers of last resort (Mehrling, 2010). The interventions were attributed to two key motivations (Stone et al, 2011):

- a) *Macroeconomic stabilization*: aimed to ease credit conditions or to restore the transmission mechanism disrupted by shocks to particular market segments.
- b) *Financial stability*: central banks recognized that the traditional crisis mandate of preserving funding liquidity had to be expanded to take into account market liquidity, defined as the ability to trade (large volumes) of debt instruments with a small impact on price, as the increasing importance of collateral-based finance left financial institutions dependent on their portfolios of marketable collateral in order to raise market finance.

The crisis toolkit was expanded to include three distinctive types of measures: outright purchases of private and sovereign debt, bank-based liquidity injections and collateral-based measures. The timing, pace of unwinding and sequencing of exit strategies differ across these measures (see Table 1).

Outright purchases were conducted either through direct interventions in private debt markets to restore market liquidity and thus increase the availability of credit (the MBS purchases in the US and UK) or in government debt markets, under the theoretical guidance of the portfolio-rebalancing channel: once assets are not perfectly substitutable (as for instance in Culbertson's (1973) 'preferred habitat theory' that proposes distinct investors preferences for certain maturities), central bank interventions can trigger yield changes and modify investors incentives away from (low yielding) government debt to (higher risk-higher yield) private debt instruments (Dale et al, 2010; ECB, 2010; Cecioni et al, 2011; Lenza et al, 2011). Outright purchase of government debt blur the boundary between monetary and fiscal policy as the central bank assumes 'quasi-debt management' functions (Borio and Disyatat, 2010).

Bank-based liquidity injections are an extension of the normal Open Market Operations: central banks inject bank reserves against collateral but it can vary the collateral requirements (accepting illiquid private instruments), the volume (full allotment or pre-determined volumes), the counterparties (extending the range of eligible institutions) and the maturity (longer maturity). Since the start of the subprime mortgage market tensions

² During the Gold Standard, Bank of England for instance often responded with both larger liquidity injections and interest rate increases to tensions on the interbank market. Interest rate increases sought to prevent capital (gold) flight or to attract capital inflows.

and until the collapse of Lehman, most large central banks engaged into bank-based liquidity injections in response to interbank market tensions (see Ceccioni et al, 2011 for a detailed account), while after Lehman the ECB deployed it as the primary tool for unconventional market interventions, invoking the bank-based nature of its financial system (Gabor, 2012).

The third type of intervention, **collateral swaps**, is unusual because unlike the previous two approaches, it involves no additional creation of central bank money but instead requires close coordination with the government's debt management office. The Securities Lending Facility (BoE) and the Terms Securities Lending Programs, both introduced in early 2008 and unwound in 2011, shared the same mechanism: the central bank offered highly liquid Treasury debt in exchange for high quality, temporarily illiquid, private debt instruments (mostly MBS). Banks could use sovereign debt as collateral to access short-term collateralized funding markets. These schemes involved direct coordination with the Treasury's debt management offices. The US Fed exchanged sovereign Treasuries for investment grade debt securities, on a 28 day maturity, at monthly auctions. At its peak, the facility injected USD 250 bn of US Treasuries, around a fourth of the overall QE purchases. In the British case, nine-months Treasury bills were specifically issued for the SLS with up to three year maturity, and by the end of the scheme in January 2009, banks had acquired GBP185 bn, double the pre-crisis volume of the Bank of England's balance sheet and close to the GBP200 bn QE program announced in March 2009 (John et al, 2012). It is important to note that the ECB did not adopt collateral swaps for at least two reasons: it holdings of sovereign debt were relatively small pre-crisis (around 10% of overall assets, see Cheun et al, 2010) and the political difficulties of pursuing coordinated policies with member states' sovereign debt management offices.

Table 1 Exit strategies

Balance sheet policies	Programs	Timing	Pace of unwinding	Sequencing
Outright purchases	QE (Fed, BoE) CBP (ECB) SMP (ECB)	pre-defined volumes; renewal contingent upon objective	a) hold to maturity or b) contract balance sheets (sell before maturity)	Decoupling Principle?
Bank-based measures	LTROs (ECB) TALF (Fed)	renewal contingent upon objective, on different collateral requirements	automatic unwinding	Decoupling Principle?
Collateral-swaps	TSLF (Fed) SLS (BoE)	pre-defined maturity	automatic unwinding	Interest rate policy

CBP=Covered Bond Program; TSLF = term securities lending facility; SLS=securities lending facility; SMP = Securities Market Program; LTRO = Long Term Refinancing Operations; TALF = Term Asset Lending Facility

Timing: when to halt unconventional measures

The duration of the unconventional interventions varied according to policy judgments about the effectiveness of unconventional measures. Although Bernanke and Reinhart (2004) advised the adoption of a target yield for government bonds to guide unconventional interventions, in practice most central banks engaged in outright asset purchases chose a less strict commitment. The US Fed and Bank of England pre-announced the volume of sovereign bonds to be purchased under the quantitative easing programs initiated in March 2009. Neither changed the practice of pre-determined volumes when it became clear that reserve injections had not delivered the desired economic stabilization and additional QE rounds were introduced³ (Cecioni et al, 2011). In contrast, the ECB's Securities Market Program entailed no commitments of volume because it was guided by different objectives: to re-establish a key segment of the monetary transmission mechanism, the sovereign bond market, disrupted by the increasingly precarious funding conditions for Eurozone sovereigns (Gabor, 2012). For this reason, the ECB announced that it would sterilize its bond purchases (withdraw the additional bank reserve injected) through one-week fixed-term deposits.

Long-term refinancing operations (LTROs) of the type announced by the ECB in May 2009 similarly entailed a well-defined maturity and pre-determined auction dates⁴, although the volume of reserves injected was demand-driven, depending on private banks' portfolio of acceptable collateral. The ECB re-introduced LTROs when, towards the end of 2011, European banks' funding conditions had deteriorated enough to raise concerns of a system-wide banking crisis (ECB, 2010; Gabor, 2012). The ECB changed the qualitative conditions of its subsequent LTROs by relaxing collateral requirements.

Although the specific framework for collateral swaps varied across individual central banks, they were designed as very temporary measures to mitigate stress in funding markets. Bank of England's SLS did not seek to ease credit conditions so defined acceptable collateral as the 'overhang of illiquid assets' produced through the securitization of loans extended prior to December 31st, 2007. The swaps had a predefined 'drawdown window' in which banks could take illiquid collateral to BoE; initially to close on October 2008, extended to 30th of January 2009 in response to Lehman's collapse. The TSLF in turn entailed minimum fees set higher than the cost of the same collateral swap in private markets, giving it an automatic unwinding once funding conditions improved (Fleming et al., 2011). Both facilities expired by early 2011.

Pace: how to normalize balance sheets

The 'normalization' of central bank balance sheets is most politically controversial in the case of outright asset purchases. The central bank has to decide whether to hold assets to maturity, a decision that may be difficult to defend in case of sustained inflationary

³ In December 2009, the ECB stopped the provision of 1-year liquidity; in February 2010, the BoE paused its gilt purchases; and in March 2010, the Fed terminated its purchases of mortgage-backed securities and agency debt (Sack, 2010; and Trichet, 2009). By early 2011 the three had returned to exceptional measures.

⁴ Thus LTRO1 entailed three distinct auctions, in June, September and December 2009; whereas LTROIII consisted of two auctions in December 2011 and February 2012.

pressures. In theory, the pace of selling should be set to preserve market neutrality and avoid large price volatility. In practice, the prospect of upward pressures on sovereign yields that would increase the costs of servicing public debt are likely to trigger government's opposition to unwinding and therefore require careful coordination with public debt management (Borio and Disyatat, 2010) and also tighten funding conditions by pushing the term structure upwards. Indeed, Bank of Japan exited by allowing the short-term government bills to mature but avoided any selling of long-term sovereign bonds (Yamaoka and Sied, 2011).

In turn, bank-based measures and collateral swaps involve automatic balance sheet adjustments at the end of operation. Central banks receive the reserves (or high quality collateral) injected and return the collateral pledged by banks. This process seemingly avoids the political difficulties that accompany exit from large-scale asset purchases, a reason often invoked by the ECB to explain its reliance on LTROs (ECB, 2010; Gabor, 2012). However, the automatic adjustment has direct, if not explicitly acknowledged, consequences for financial markets in general, and collateral markets in particular: if private banks can substitute central bank liquidity with private liquidity conditions (Gabor, 2012).

Sequencing: balance sheet policy vs. interest rate policy

Central banks' narration of the sequencing problem is essential because it cements the commitment to return to the pre-crisis framework where interest rate manipulation is the key policy tool, whereas balance sheet policies (or liquidity management) are subordinated to implementing interest rate decision in the unsecured interbank market (Plosser, 2012). The sequencing question entails the following problem: should interest rate policy be deployed before balance sheets are normalized? This question is relevant when central banks decide to raise interest rates from the zero-bound, seeking to tighten credit conditions when projections suggest inflation will be above target. The difficulty rests on how to implement this decision in money markets flush with liquidity injected through balance sheet policies – unless the central bank absorbs the excess liquidity, money market rates will fail to follow policy rates.

In theory, balance sheet policy can be conducted independently from interest rate policy. Indeed, Borio and Disyatat (2010) argued that interest rate decision can be taken independently from the size/composition of the balance sheet if the central bank adopts the “Decoupling Principle” – insulating the market for bank reserves (the unsecured interbank market) where interest rate decisions are implemented from balance sheet policies through either sterilizations (absorbing liquidity through deposit-taking operations) or by remunerating reserves at the policy interest rate. Both of these mechanisms are typically deployed where central banks actively manage exchange rates.

The difficulty with the Decoupling Principle, for most central bankers, then rests with the political economy implications of discretionary balance sheet policies because it opens up

the fundamental question of what should be the mandate of central banks in capitalism. The US Fed's representative Charles Plosser (2012) summarized that succinctly:

'It is also sound policy to limit the discretionary ability of central banks to engage in policies that fundamentally belong to fiscal authorities or private markets.'

In other words, discretionary balance sheet policies are politically problematic for central banks because the mandate to intervene directly in private and sovereign debt markets will require them to constantly construct and defend the desirability of the two neutrality principles. Since any 'depoliticized' narrative of central banking is inconsistent with a separation between interest rate policies and liquidity management, the post-crisis central banks have insisted on redrawing the pre-crisis boundaries of macroeconomic management. These efforts, it will be argued next, are rendered more difficult by the shift to collateral-based finance.

Collateral-based finance

Since the onset of the financial crisis, a rapidly growing scholarship has drawn attention to the importance of collateral-based finance and its implications for macroeconomic management, particularly in what concerns the relationship between monetary policies and collateral markets (Singh, 2011; Singh and Stella, 2012; Gabor, 2012; Banque de France, 2012; Hrung and Seligman, 2011). The rapid expansion in credit intermediated by the shadow banking sector relied on collateral-based funding obtained in wholesale (repo) markets (Pozsar, 2011). The lender in a repo transaction offers cash in return for collateral, with a promise to re-sell the collateral and receive the cash when the repo matures (from overnight to over a year).

Collateral-based finance expands the basis for private liquidity creation from bank reserves under the traditional intermediation model to include marketable collateral that similarly satisfies funding and liquidity needs. To understand collateral-based liquidity creation, and the challenges this raises during times of market stress, Singh and Stella (2012) distinguish between bank reserves (termed D) and collateral (C). Central banks have full control over D through balance sheet policies, whereas C can be influenced by collateral management strategies of global banks (Singh, 2011), sovereign and central bank.

During periods of normal market conditions, D and C are very close substitutes. Financial institutions tend to economize on bank reserves since it provides no returns and prefer C because a) it is eligible for central bank operations (easily substitutable for D) and b) satisfies preference for safety of principal and yield. The process of collateral-based money creation is similar to the bank-based system: collateral can be re-used (re-hypothecated), the longer the intermediation chains supported by the same collateral, the higher the velocity of this 'shadow reserves' (Singh, 2011). The stock of liquid collateral, private and sovereign, is then key to the pace and scope of financial intermediation: for example, Pozsar (2011) offers a demand-side argument that shadow-banking innovation

arose in response to the shortage of high-quality (short-term government debt) collateral demanded by large institutional investors.

Yet if C provides the same liquidity as D in ‘normal’ times, this may change dramatically under market distress as the moneyness of an asset depends on two distinct characteristics of a collateralized-repo transaction:

- a) **Haircut:** the cash lender in a repo transaction requires the nominal value to be higher than the cash provided in order to minimize market risk (the risk of price volatility). Lower quality collateral then requires higher haircuts.
- b) **Liquidity:** perceptions of collateral liquidity are important because of the practice of daily re-valuation of collateral portfolios. Collateral is marked-to-market, if its market price falls the cash borrower may be required to post additional collateral, increasing repo costs. The liquidity of collateral markets becomes essential: very liquid markets have less price volatility, whereas price (and thus repo collateral costs) can vary widely in illiquid markets.

Perceptions of quality and liquidity of collateral are pro-cyclical (Brunnermeier et al, 2011; ECB, 2011). During normal times, haircuts are low (and liquidity high) for both private and sovereign assets used as marketable collateral. But market distress and the increased preference for liquidity is accompanied by a segmentation or tiering of collateral markets as flight to safety/liquidity creates two distinctive types of collateral: high-quality collateral that preserves its moneyness (high-rated sovereign bonds) whereas crisis-induced price volatility for assets in illiquid markets (as for instance with MBS) translates into haircut increases and margin calls, thus reducing their attractiveness as marketable collateral. Singh and Stella (2012) term the first C1 (easily substitutable for D overnight) and the second C2 (possibly substitutable depending on central banks’ unconventional measures), a distinction that is analytically useful for exploring the collateral consequences of unconventional monetary policies.

For Singh and Stella (2012), the collateral consequences have to be approached from a ‘substitutability angle’ that indicates the extent to which unconventional monetary policies “provide liquidity relief” (see Table 2). Thus, outright purchases of high quality sovereign bonds (under quantitative easing programs) simply substitute two highly liquid forms of money: D and C1. In contrast, outright purchases of C2 (as in the US, UK) or LTROs on easy collateral requirements (C2) inject central bank money (D) and thus provide effective liquidity relief. The most effective method to provide collateral liquidity is through collateral swaps that exchange C1 for illiquid C2. The central bank thus performs a key function in a crisis-ridden collateral-based system: it injects unencumbered collateral into the financial system and mitigates the adverse consequences of the shortage of safe assets. Collateral policies affect directly the overall degree of market and funding liquidity: collateral-based finance ties these together.

Yet the focus on ‘substitutability’ downplays the dynamics of the process, or the channels through which unconventional policies may influence the movements of an asset from C1 to C2 (and viceversa). In other words, the boundary between C1 and C2 is more porous

than the collateral literature recognizes. According to Gordon (2012), the distinction runs along information lines: information insensitive collateral – i.e. sovereign bonds - preserves its moneyness irrespective of market conditions. However, membership of the exclusive C1 club is neither automatic nor irrevocable for sovereigns because concerns about funding liquidity may spill over into collateral markets in a collateral-based financial system. For instance, Bolton and Jeanne (2011) persuasively argue that monetary unions with integrated banking systems generate externalities that benefit high-rated sovereigns that issue safe-heaven assets but also spread collateral discrimination among lower-rated sovereigns that eventually moves that collateral from C1 into C2. First, whereas the outright purchase of government bonds may not provide additional liquidity relief along Singh and Stella (2012) lines, it contributes to preserving the function of C1 as marketable collateral by signaling that the central bank stands ready to intervene in sovereign bond markets when concerns about the crisis implications for public debt sustainability may reduce collateral-driven demand. In turn, bank-based liquidity injections (LTROs) can only indirectly influence the shifts between distinct collateral categories, contingent on private banks’ collateral management strategies. At first sight, banks could engineer a shift from C1 to C2 because collateral management entails a ‘the cheapest to deliver’ approach – this is why lower-rated sovereign collateral was treated as C1 collateral in European repo markets before Lehman’s collapse, since in liquid markets high yield/low price assets are cheaper to deliver (for example, FT Alphaville reported that Italian sovereign debt was in high demand for repo transactions throughout early 2011 precisely because of its low price). But in the absence of central bank’s explicit commitment to stabilize illiquid collateral values, the very fine line between cheapest to deliver and C2 collateral can be easily crossed if collateral managers do not trust that fiscal policy can ensure stability and liquidity in sovereign bond markets. Collateral swaps do provide liquidity relief but have no direct consequences for the movements between the two types of collateral, although indirectly an injection of safe collateral may bring funding stability that restores confidence and prompts portfolio realignments into riskier asset classes (C2).

Table 2 Through a collateral lens: collateral consequences of adoption and exit

Types of balance sheet policies		UMP measures	Implication	Exit strategies	Implication
Outright purchases	private/low rated sovereigns	D↑, C2↓	may contribute to C2 → C1	C2↑ D↓	-
	sovereign bonds	D↑, C1↓	- : no liquidity relief + : preserves “moneyness” of C1, prevents C1 → C2	C1↑; D↓	C1 → C2?
Bank-based measures		D↑, C2↓	+ : liquidity relief +? C2 → C1 contingent on banks’ collateral management strategies	D↓, C2↑	C1 → C2?
Collateral swaps		C1↑, C2↓	liquidity relief	C1↓, C2↑	-

Note: the ↓ indicates that the central bank absorbs collateral/bank reserves from the formal system of financial intermediation (and viceversa)

Similarly, unwinding extraordinary balance sheet interventions in a collateral-based financial system may trigger movements from C1 into C2 if the central bank does not attribute any policy significance to stabilizing both illiquid and liquid collateral values. Paradoxically, immediate exit from large-scale asset purchases will do little to tighten financing conditions (and mitigate inflationary pressures) if it replaces D with C1 unless the increase in supply triggers adverse market reactions that would move that move sovereign debt from C1 into C2. Conversely, the automatic exit from LTRO-type measures may have negative consequences because it requires banks to replace C2 with C1 collateral in order to substitute central bank funding with market funding. The ensuing scramble for safe assets and the collateral scrutiny this may trigger could push some low C1 collateral into C2 - as it happened in Eurozone, when the ECB's refusal to intervene in collateral markets during the first stage of the Greek crisis (May 2010) in the context of the expiry of the first one-year LTRO dramatically reduced the use of Portuguese/Irish/Greek bonds in repo transactions; a story later re-enacted for Italy. The collateral swaps in turn were designed to specifically avoid unwinding *before* liquidity was fully restored in markets for collateral - the pricing mechanism ensured financial institutions would continue to tap that source of collateral only until private wholesale funding became cheaper.

In sum, the shift to collateralized finance brought a qualitative change in the relationship between the two neutrality principles and the challenges this posed to the mainstream understanding of coordination between monetary and fiscal policies. Indeed, central banks cannot abandon one and uphold the other where funding and collateral market liquidity are closely connected. The ECB's example illustrates this dilemma clearly: whereas its bank-based measures amount to an unequivocal departure from the market neutrality principle, its difficulties in coordinating with sovereign debt management authorities prevented it to successfully stabilize funding conditions for European banks (Gabor, 2012).

Collateral-based finance: towards a new central banking

1. The theoretical foundations for interest-rate policies: a return to EMH?

If broad liquidity conditions heavily influenced by cross-border flows and the collateral management of large global banks (Bruno and Shin, 2012; Singh, 2011), why is a return to short-term interest rate manipulation desirable? Furthermore, how to account for the risk taking channel- through macroprudential policies alone?

2. The practice of central banking: shifting interest rate policy on collateralized funding markets?

Instead of a return to a precrisis framework where central banks manipulate bank reserves to influence unsecured short-term market rates, central banks could either commit to stabilize markets for collateral and collateral liquidity or shift to targeting repo interest

rates (Klee and Stebunovs, 2011)? A new regime for monetary policy: to preserve the liquidity of collateral or the marketable collateral properties of sovereign debt?

3. *Interest rate policy vs. balance sheet policy?*

To what extent is this distinction helpful in terms of accountability/credibility or independence? Should it be drawn along monetary policy vs. macroprudential policy lines?

4. *Central banking in crisis: the institutional framework for preserving liquidity of collateral*

Unconventional monetary policies are not neutral with respect to collateral markets, should central banks formally include in their crisis tooling specific policies to preserve the liquidity of collateral during times of crisis?