

The Social Fabric Matrix Approach to Central Bank Operations: An Application to the Federal Reserve and the Recent Financial Crisis

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Abstract This chapter utilizes the social fabric matrix approach (SFM-A) to provide a detailed description of the Federal Reserve's (Fed's) daily operations and the recent financial crisis. The SFM of the Fed's operations presents the primary components – major norms, institutions, technologies – relevant on a day-to-day basis. The SFM is then used for normative systems analysis (Hayden 1998) to show the articulation of major norms via sub-criteria, rules, regulations, and requirements into significant influences on the actions of authorizing and processing institutions in the Fed's operations. From the normative systems analysis, three types of time – intraday, maintenance period, and seasonal – in the Fed's daily operations can be explained. Overall, the Fed's operations are driven by the goals of stabilizing the payments system and the financial system. Other major norms, such as market efficiency, are important in terms of their influence, but they can become counterproductive to the Fed's ability to stabilize the payments system and the financial system at times, as they were during the mid-to-late 1990s. Given the SFM, normative systems analysis, and description of time and timeliness in the Fed's operations, seven general principles of the Fed's operations are presented, several of which are contrary to popular opinion (even among economists) regarding how central bank operations actually work. Of overarching importance is the realization that the Fed's operations are concerned with setting an interest rate, not controlling the money supply, which is in fact not possible. The events of August 2007 through December 2008 relevant to the Fed's daily operations are described and considered within the context of the previously laid out general principles, while as a result of information gathered during this period, three additional general principles of the Fed's operations are provided.

Introduction

While a detailed understanding of monetary operations has been central to research in the Post Keynesian endogenous money tradition for decades, it is not a stretch to suggest that it is now also a well-established area of research within neoclassical

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monetary economics. Until recently, however, neoclassical research related to bank behavior in the US federal funds market had little relation to research on the Fed's behavior, and vice versa, beyond a few notable exceptions. This all change in the late 1990s, as neoclassical economists "found" several policy issues that required an understanding of Fed operations and bank behavior together – such as concerns about policy options at the zero bound for interest rates, retail sweep accounts, payments system crises, and increased use of non-central bank wholesale settlement options.

Particularly noteworthy is that a number of authors in the Post Keynesian tradition, and a few in the neoclassical tradition (e.g., Bindseil 2004), have argued that central bank operations bear little resemblance in reality to the traditional models such as the money multiplier that have nonetheless been overwhelmingly prevalent. Fullwiler (2001, 2003) applied the social fabric matrix approach (SFM-A, presented in Hayden 2006) in detailing the Federal Reserve's (the Fed's) operations and came to similar conclusions. The purpose of this chapter is to extend previous analyses applying the SFM-A to the Fed's operations and to consider this within the context of the functioning of US money markets during the recent mortgage or "subprime"-related financial crisis. The significance of the SFM-A for this particular area of research is that the institutional context under investigation is at the core of the United States' financial system; clear thinking about this core enables the subsequent development of a larger paradigm for future macroeconomic policy research that is more consistent with real-world financial interactions than has traditionally been the case.

Social Fabric Matrix of the Fed's Daily Operations

Figure 1 presents a basic social fabric matrix (SFM) of the Fed's daily operations. Each of the components listed vertically on the left as "delivering components" are also listed horizontally across the top as "receiving components." As is normal practice, a "1" within a cell of a matrix denotes that a delivery occurs from a particular delivering component to a particular receiving component. From the figure, nearly every component aside from the beliefs has several deliveries and receipts, and due to space constraints it is not possible to explain in a detailed manner every one of the deliveries; instead, the approach here is to begin by discussing the components and then to discuss deliveries in individual cells as they become important to the analysis.

Beliefs are indispensable to understanding the normative context of the Fed's operations. The beliefs listed in Fig. 1 are denoted as NB_i (where $i = 1, 2, 3$, and so forth), which is the notation in Hayden (1998) used to model beliefs as "normative belief" criteria within a normative systems analysis; this is discussed in more detail and applied in the following section. The belief that the Fed controls the money supply (NB1) is at the core of the neoclassical paradigm and is readily seen in economics textbooks from the introductory to the doctoral level in the form of the money multiplier model, in which the central bank deliberately alters the quantity of reserves in order to achieve a desired rate of bank deposit expansion. Also central to the neoclassical paradigm is a belief that markets are efficient (NB2).

Receiving Components \ Delivering Components	NB					IA					IP				T			
	NB1	NB2	NB3	NB4	NB5	IA1-1	IA2-1	IA2-2	IA2-3	IA2-4	IA2-5	IP-1	IP-2	IP-3	IP-4	T1	T2	T3
NB1: Central bank controls money supply						1	1											
NB2: Market efficiency						1	1											
NB3: Stabilization						1	1	1	1	1	1	1		1	1	1		
NB4: Neo-Jeffersonian view of banks						1												
NB5: Taxes/bonds finance govt spending						1												
IA1-1: Congress & President	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
IA2-1: FOMC/Board of G'vners/Fed Banks	1	1	1			1	1	1	1	1	1	1	1	1	1	1	1	1
IA2-2: FDIC			1			1	1		1	1	1			1	1		1	1
IA2-3: Comptroller of the Currency			1			1	1	1		1				1	1		1	1
IA2-4: State bank regulators			1			1	1	1	1					1			1	1
IA2-5: Treasury			1			1	1	1				1	1	1		1	1	1
IP-1: NY Fed Open Market Desk			1			1	1				1		1	1	1	1	1	1
IP-2: Banks		1				1	1	1	1	1	1	1	1	1	1	1	1	1
IP-3: Primary dealers		1				1	1				1	1	1	1	1	1	1	1
IP-4: Private payment clearinghouses		1				1	1				1	1	1	1		1	1	1
T1: Double-entry accounting						1	1	1	1	1	1	1	1	1	1			
T2: Payment clearing/settlement						1	1	1	1	1	1	1	1	1	1			
T3: Financial innovations						1	1	1	1	1	1	1	1	1	1			

Fig. 1 Social fabric matrix for the Federal Reserve’s operations

In this case, the reference is primarily to finance literature suggesting that financial markets are efficient in pricing risk, providing liquidity, allocating scarce funds, settling payments, and so forth. The social belief criteria for NB3 refers to the policy goal of stabilization or the desirability of ensuring that economic and financial outcomes are well within certain thresholds. The neo-Jeffersonian view of banks (NB4) refers to a traditional American suspicion of enabling the amassing of economic power in the financial system, and banks in particular, in contradistinction with the Hamiltonian view of banking and finance; in modern times, this belief is often held by political liberals and some small government, more populist-oriented political conservatives (such as Pat Buchanan or Lou Dobbs). Both political liberals and conservatives – as well as economists of either persuasion – subscribe to the view that there are financial constraints upon the federal government (NB5) that must be taken into consideration when evaluating policy and policy proposals.

The institutions listed in the SFM range from key law making institutions such as Congress and the President (here listed together for simplicity instead of breaking down further, as the distinction is not overly crucial to the analysis in this case); regulatory institutions such as the Fed (in this case, again for simplicity, the Board of Governors, Federal Open Market Committee (FOMC), and regional Federal Reserve Banks are listed as a single institution), bank regulators (which also includes the Fed), and the Treasury; and, finally, the rest of the institutions listed are directly involved in some manner in the Fed’s monetary operations. As with beliefs, a more detailed discussion of the institutional structure (and of the notation

used in Fig. 1 for labeling the different types of institutions) is in the normative systems section below.

There are three important technologies (T_i) in the SFM for the Fed's operations. The most fundamental of these is double-entry accounting (T_1). That double-entry accounting has impacted the system is beyond dispute, particularly where financial markets are concerned, as the creation of any financial asset by definition simultaneously creates an entry on the liability/equity side of a balance sheet. Views on how important double-entry accounting has been to the origins of the capitalist system and its continued evolution range from those suggesting it is a key technology in creating a conceptual framework for planning and control (e.g., Sombart 1924, Most 1972) to suggestions that accounting practices instead respond to changes in the business environment rather than vice versa (e.g., Yamey 1964, Edwards 1991). Consistent with Hayden's (1982, 1998, 2006) incorporation of technology and technological criteria into the SFM methodology, Previts and Merino's (1998) history of accountancy in the USA suggests a middle view in which double-entry accounting is "a 'condition' affecting and affected by market evolution" (5).

In the present context, the Fed's daily operations are financial transactions that occur on its own balance sheets and those of other banks, primary dealers, and other financial institutions. The development of electronic payment systems (another important technology in the Fed's monetary operations discussed below) that enable trillions of dollars to change hands daily is built upon the reality that loans, trades, and other sorts of electronic payment flows – including Fed operations – are simply credits and debits on the balance sheets of various institutions. In fact, financial assets (such as stocks, bonds, and deposits) largely do not exist in tangible form anymore, but instead exist solely as balance sheet entries. Similarly, the various trading and valuation techniques that were at the center of the rise and fall of mortgage-related securities, as well as the attempted policy responses to the latter, are necessarily embedded within the modern technology of accounting. In short, to understand the Fed's operations, one must understand the technology of double-entry accounting.

Payment clearing and settlement technologies (T_2) – which, as noted above, are likewise necessarily embedded within modern accounting methods – have been referred to as the infrastructure of the modern business world (Shen 1997). Most of the Fed's operations are concerned with wholesale payment clearing and settlement, which is therefore the focus here. Large value transfer systems (LVTS), such as Fedwire, the Fed's LVTS, and CHIPS, a private clearinghouse whose membership consists of primarily large New York banks and which handles most international transactions that involve the US dollar, are the largest wholesale settlement systems. In 2007, average daily value of funds transfers on Fedwire was \$2.7 trillion, or around 20% of annual nominal GDP (Board of Governors 2008). Fedwire also operates a book-entry security settlement system which enables bonds issued by the Treasury, government sponsored enterprises, and other institutions to deliver ownership of securities against payment; in other words, these securities exist only as accounting entries, not in physical form. Securities transfers on Fedwire's

book-entry system were about \$1.7 trillion per day in 2007 (Board of Governors 2008). Total dollar value of payments settled via CHIPS rival Fedwire funds transfers. A large percentage of securities transactions are cleared through subsidiaries of the Depository Trust and Clearing Corporation (DTCC) including the Depository Trust Corporation (DTC), National Securities Clearing Corporation (NSCC), and the Fixed Income Clearing Corporation (FICC), which together provide clearance services for “virtually all equity, corporate debt, municipal debt, government securities, mortgage-backed securities, and emerging market sovereign debt trades in the USA totaling more than \$1.7 trillion daily” (Bond Market Association and the Depository Trust and Clearing Corporation 2003, 9). Lastly, there are several small- and medium-size payment clearing systems in the US, such as automated clearinghouses (ACH) and check clearing, which actually account for the majority of payment transfer volume.

Wholesale payments systems settle payments either via netting (where only net changes to an institutions account must be settled at the end of the day or at specific times) or via real-time gross settlement (RTGS, where final settlement via debits and credits to accounts occurs immediately). Fedwire is the largest of the RTGS, while CHIPS moved in 2001 from netting to a sort of RTGS/netting hybrid that settles most payments immediately but nets others for final settlement later in the day. DTCC’s subsidiaries settle netted transactions via Fedwire transfers of reserve balances, while most small banks use local clearinghouses to clear local transactions and then settle netted obligations using Fedwire.

Financial innovations (T3) in the private sector financial system related to the Fed’s daily operations – particularly in the money markets and in the wholesale payments system – have been ongoing. Hyman Minsky recognized in 1957 that the continued evolution of the federal funds market as a central borrowing and lending market for banks was enabling fewer reserve balances to support the same level of economic activity (Minsky 1957). The proliferation of liability management techniques by banks and the continuing evolution of wholesale markets for short-term borrowing such as the federal funds, Eurodollar, repurchase agreement, and commercial paper markets influence the Fed’s operations since they provide avenues for banks to quickly meet reserve requirements, payment needs, or the maturing of short-term commitments.

Innovations in the wholesale payments system have had similar effects on the Fed’s operations. As noted, electronic payment clearing and settlement is simply a method of crediting and debiting account balances in a double-entry accounting system. For instance,

A typical Fedwire transaction takes only a few seconds... Once Fedwire receives the payment instruction from [a] bank, the bank’s account at the Federal Reserve will be debited ... while the account of [the receiving] bank at the Federal Reserve will be credited Once this funds transfer is completed, the payment is said to be settled. Fedwire sends an electronic message to [the receiving] bank to confirm the settlement. (Shen 1997, 46)

However, since payments can be cleared electronically and the information can be stored in computers, the same quantity of reserves is able to facilitate far more payments due to the increased speed that results. Consequently,

In recent decades, even while the banking industry was growing faster than real economic activity, the dollar value of funds transmitted via large-dollar electronic payments systems was growing relative to the size of banks... . Two decades ago, daily transfers were less than one-tenth as large as total bank liabilities. By the mid-1990s, the ratio had risen to seven times its value in the early 1990s... .

[Over the same period] the sum of banks reserve and clearing balances ... at Federal Reserve Banks relative to their total liabilities fell markedly: After averaging close to 4% in the early 1970s, reserve balances as a proportion of liabilities averaged less than 1% by the mid-1990s. As a consequence, the value of banks' electronic payments relative to their reserve balances increased dramatically: By 1994, the ratio of the value of fedwire transfers to reserve balances was about forty times its 1973 value. (Hancock and Wilcox 1996, 871)

At present, it is not uncommon for individual banks to have daily payment flows that are 100 or 200 times the reserve balances that are kept in a bank's reserve account at the Fed (Furfine 2000).

A Normative Systems Analysis of the Fed's Daily Operations

Putting together a SFM is but a first step within the SFM-A approach, albeit an important and indispensable one. One must then decide how to use the completed SFM. Here, normative systems analysis based on Hayden (1998) is carried out in order to define and describe the normative criteria guiding relevant institutional interactions in the context of the Fed's daily operations. The normative systems analysis thus complements the SFM by providing a framework for more detailed investigation into the interaction of normative criteria and institutional action. Specifically, it requires the researcher to detail the criteria, rules, regulations, requirements, authoritative institutions, and processing institutions; together these determine the ends toward which the system is dynamically evolving. The process of normative systems analysis will generally lead the researcher to primary sources such as legal or regulatory documents, speeches or other accounts by regulators and policymakers, and well-documented accounts by other researchers of the normative characteristics of the system. In short, the normative systems analysis enables a researcher to answer the question "how do we know that we know how a system works?"

Subcriteria, Authorizing Institutions, and Processing Institutions in the Fed's Daily Operations

The beliefs or major norms described in the previous section are, to use Hayden's words, normative criteria that serve as standards for evaluation of institutional processes. The application of Hayden (1998) here is to recognize that these beliefs or major norms have direct or indirect influence at a number of different points in the process, and to provide a framework for explicating these influences.

To begin, Hayden (1998, 95) writes that “each major norm that applies to numerous institutional settings has a number of sub criteria ... that apply to particular institutional situations or cases.” Thus, sub-criteria or sub-beliefs are evaluative criteria in particular circumstances that are consistent with primary belief criteria or major norms; they can also reflect or further elaborate upon the ideological or otherwise theoretical basis for the belief itself. Table 1 lists the beliefs or major norms (NB*i*) from Fig. 1; the right-hand column of Table 1 lists corresponding sub-beliefs or sub-criteria (nb*i*-*j*, where *i* refers to the corresponding major norm, and *j*= 1, 2, 3, etc., to denote different sub-criteria for a given NB*i*).

Consider NB1 (“Central Bank Controls the Money Supply”) from Table 1, which has three sub-criteria, nb1-1 (“Deposits and Reserve Balances Fund Bank Loans”), nb-2 (“Reserve Requirements Constrain Banks’ Abilities to Lend”), and nb1-3 (“The Fed Exogenously Controls Reserve Balances”). As previously noted, NB1 is central to the neoclassical economics paradigm for monetary policy and originates in the money multiplier model. Specifically, these sub-criteria reflect the belief – which remains influential among policy makers – that the quantity of excess reserve balances is set directly and exogenously (in the policy sense) by Fed actions (the traditional “three tools” of monetary policy: discount lending, open market operations, and setting reserve requirements) and this quantity has a direct effect upon the growth or contraction of bank liabilities, if not immediately then at least over some time horizon. NB2 (“Market Efficiency”) and NB3 (“Stabilization as a Primary Policy Goal”) are shown in Table 1 to each have three sub-criteria, as with NB1. NB4 (“Neo-Jeffersonian View of Banks”) and NB5 (“Taxes and Loans Finance Government Spending”) are a bit different in the context of this paper than

Table 1 Major norms and beliefs in the Fed’s operations

Major norms (NB <i>i</i>)	Subcriteria (nb <i>i</i> - <i>j</i>)
NB1: Central Bank controls the money supply	nb1-1. Deposits and reserve balances fund bank loans
	nb1-2. Reserve requirements provide control over loan creation
	nb1-3. The Fed can exogenously control reserve balances
NB2: Market efficiency	nb2-1. Markets efficiently price risk and allocate funds
	nb2-2. Markets can efficiently and safely settle payments
	nb2-3. Government intervention creates instability/moral hazard
NB3: Stabilization as a primary policy goal	nb3-1. Stabilization of the payments system
	nb3-2. Stabilization of the financial system
	nb3-3. Stabilization of the macroeconomy
NB4: Neo-Jeffersonian view of banks	nb4-1: Government should not subsidize banks
NB5: Taxes and Bonds Finance Government Spending	nb5-1: Avoid negative effects on the federal government’s fiscal position

NB1, NB2, and NB3. This is due to the fact that while the former have only a single sub-criteria each in Table 1, both have several more sub-criteria that would become relevant were the context of the analysis expanded beyond monetary operations.

The notation for the institutions in Fig. 1 is to denote sub-categories presented in Hayden (1998). These are higher institutional authorities (denoted as IA1-*i*), other or lower institutional authorities (denoted as IA2-*i*), and processing institutions (denoted as IP-*i*). The US Congress and the President are listed together as the primary higher institutional authority (IA1-1). Together, they are responsible for important legislation (such as the Federal Reserve Act, and revisions to it) and operational directives (such as foreign exchange rate policy) that influence the normative context of the Fed's operations. The FOMC, Board of Governors, and Federal Reserve Banks together are the most important lower institutional authority (IA2-1), since they set monetary policy given the criteria and rules (defined below) set down by the higher authorities; this component will be referred to simply as "the Fed" below. Other institutional authorities are the other bank regulators besides the Fed (FDIC (IA2-2), Office of the Comptroller of the Currency (IA2-3), and state bank regulators (IA2-4)), which are discussed in more detail in the later section on recent events in the financial system, and the Treasury (IA2-5), whose authority in this context is primarily derived from its role in the collection of taxes.

The processing institutions are denoted as IP-*i*; these institutions receive regulations and requirements from institutional authorities which set the context for their behavior. The Open Market Desk at the New York Fed (IP-1) is responsible for carrying out open market operations in accordance with the policy and strategy set by the Fed. Banks (IP-2) are the key processing institutions for monetary policy, the payments system, and the financial regulatory structure; they trade reserve balances held in Fed accounts in the federal funds market, use reserve balances to settle payments, meet Fed regulations and requirements, and are subject to requirements of bank regulatory agencies. Primary dealers (IP-3) are dealers in US Treasury securities, some of which are also banks, which engage in the private sector side of the Open Market Desk's trades related to open market operations. Private wholesale or retail payment clearinghouses (IP-4) encompasses a number of institutions, some very large and some very small, that clear and settle private and public sector payments; many of these clearinghouses settle payments on a netted basis, leaving only a small percentage of gross payments to be settled by direct payments sent usually via balances in Federal Reserve accounts.

Rules, Regulations, and Requirements in the Articulation of Major Norms

Hayden (1998) writes that both John R. Commons (1995) and Karl Polanyi (1957) demonstrated that normative criteria were established and then implemented or otherwise "carried out" through prohibitions, obligations, and permissions, or what Commons referred to as "working rules." As Commons put it,

A working rule lays down four verbs for the guidance and restraint of individuals in their transactions. It tells what the individual *must* or *must not* do (compulsion or duty), what they *may* do without interference from other individuals (permission or liberty), what they *can* do with the aid of collective power (capacity or right), and what they *cannot* expect the collective power to do in their behalf (incapacity or exposure). (1995, 6; emphasis in original)

Hayden (1998) presents a taxonomy utilizing the terms rules, regulations, and requirements, which is inspired by Hayden’s reading in the area of normative philosophy. Hayden’s approach explicitly incorporates the normative process by which institutions articulate prohibitions, obligations and permissions such that major norms ultimately guide or at least significantly influence institutional action.

The normative systems analysis framework presented in Hayden (1998) might be summarized as follows: primary normative criteria – such as major norms NB1 through NB5 in Fig. 1, and their respective sub-criteria shown in Table 1 – give rise to policy goals, standards, and so forth. To carry out the process and achieve the desired normative ends, the appropriate rules, regulations, and requirements are articulated and implemented. Figure 2 illustrates the relationships between major norms, institutional authorities, and processing institutions as described by Hayden. From the figure, the sub-criteria are delivered to the higher institutional authorities as standards for rules, which frequently appear in legislation and are written to both embody and be consistent with the primary criteria. Hayden (1998, 97) writes that higher institutional authorities generally undertake great effort to explain the norms and the reason the rules are necessary; the higher institutional authorities additionally frame, structure and explain the rules, the situations in which the rules are to be applied, which rules are to be applied, and the acceptable reasons for applying the rules. Lower authorizing institutions design regulations that appeal to rules as reasons for their existence and which attempt to control, govern, or otherwise shape the behavior of processing institutions in a manner consistent with rules by setting

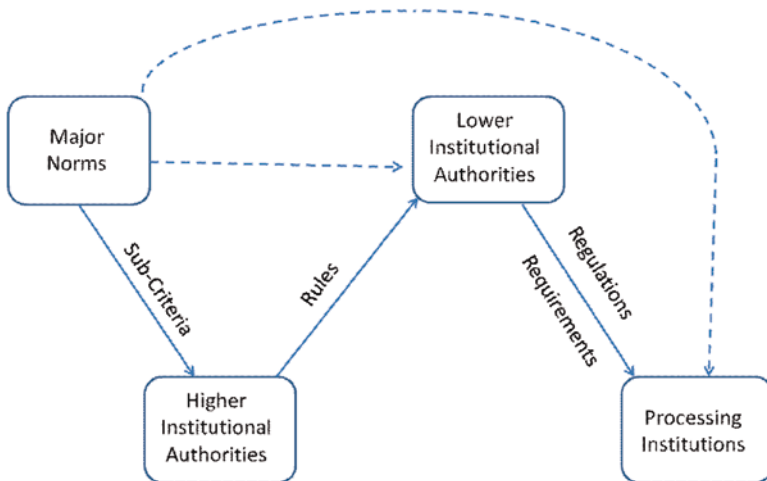


Fig. 2 Articulation of major norms into rules, regulations, and requirements

down various requirements. Requirements require responses by processing institutions to situations in order to fulfill the regulations, such as a bank adhering to an established required reserve ratio on deposits, capital requirements against assets, criteria and collateral requirements for receiving loans from the central bank or against government deposits held by the bank, or the specific procedures for managing a reserve account at the central bank.

Overall, institutional actions occur within the context of rules, regulations, and requirements and are thus normative in that “working rules” that dictate prohibitions, obligations, and permissions are in place and ultimately derive from the primary belief criteria. The dotted lines in Fig. 2 correspond to the indirect influence of major norms on the actions of lower institutional authorities and processing institutions via the design and implementation of rules, regulations, and requirements. This is consistent with the SFM in Fig. 1, which – as is common practice – presents beliefs or major normative criteria being delivered to a variety of institutions at various levels of authority; however, even as there is an implied influence of major norms upon processing institutions in Fig. 2, Hayden (1998, 96) notes that institutional actions may be consistent with the desired normative ends even as the individual processing institutions may not know or at least may not be in agreement with the required action. Thus, while deliveries in Fig. 1 present belief criteria specific to individual institutions (i.e., banks and other private financial institutions have a general belief that financial institutions can efficiently price financial assets, settle payments, and generally abhor government intervention in these areas; financial regulatory institutions are generally designed to be concerned with stability of particular parts of the financial system), the articulation of major norms into rules, regulations, and requirements may provide prohibitions and obligations that result in behaviors inconsistent with some other belief criteria. As Hayden (1998, 100–103) points out, when such conflicts are significant, the negative consequences for the entire system can be significant.

Major Norms, Subcriteria, and Rules in the Fed’s Operations

Given space constraints, neither each entry in the SFM in Fig. 1, nor the role of each rule, regulation, and requirement related to the components of Fig. 1 can be described completely. But enough of the key characteristics of the system can be explicated within this framework to create an understanding of the Fed’s daily operations. The approach here is to begin with two important rules: The Federal Reserve Act of 1913 (FRA), and the Depository Institutions Deregulation and Monetary Control Act of 1980 (DIDMCA), which amended the FRA. The analysis will then broaden and deepen in order to develop a working framework for understanding the normative context of the Fed’s operations.

The FRA established the Federal Reserve System as the nation’s central bank, and thus as a lower institutional authority according to the framework here. There are several primary belief criteria from Table 1 for the FRA with respect to the Fed’s operations, namely control of the money supply (NB1), market efficiency (NB2),

stabilization (NB3), and a neo-Jeffersonian view of banks (NB4). The FRA defines the existence and powers of the regional Federal Reserve Banks in Sects. 2, 4, 5, 13, and 14. The establishment of the Board of Governors is made in Sects. 10 and 11. The power of the Federal Reserve Banks to print Federal Reserve notes is given in Sect. 16. The establishment and powers of the FOMC are in Sect. 12A. The establishment of commercial banks as member banks of the Fed – that is, as processing institutions according to the normative systems analysis here – is explained in Sects. 6–9. The Board of Governors’ power to set reserve requirements on member banks is provided in Sect. 19. Section 15 enables the Secretary of the Treasury to deposit Treasury funds in the Federal Reserve Banks and to use the Federal Reserve Banks as its fiscal agents.

Stabilization (NB3) was originally one of the most important, if not *the* most important, primary evaluative criteria – and remains so – particularly in regard to the payments system (nb3-1) and the financial system (nb3-2) as far as the Fed’s operations are concerned, though there was also significant emphasis placed upon promoting operating procedures consistent with a “sound currency,” a reference to macroeconomic stabilization (nb3-3) as understood at the time. The first paragraph of the FRA announces that the purpose is “to provide for the establishment of Federal reserve banks, to furnish an elastic currency, to afford means of rediscounting commercial paper, to establish a more effective supervision of banking in the United States, and for other purposes.” The statement “to furnish an elastic currency” is generally interpreted as obligating the Federal Reserve to ensure liquidity and stability in the payment system – again, as in nb3-1 – particularly in regard to difficulties frequently encountered with both prior to 1913 that often led to broader financial panics (e.g., Spahr 1926; Myers 1970).

A neo-Jeffersonian view of banks (NB4) was and still is significant as there has been political opposition to a central bank throughout the nation’s history; for instance, the separation of powers within the Fed and the twelve district banks presiding over regions drawn according to the distribution of the population in 1913 arise essentially from the influence of this primary belief. Political opposition to the Fed’s existence has become less significant (though some opposition certainly still exists), however the Jeffersonian perspective remains important with respect to the role of regional Fed banks in the Fed’s operations such as managing the payments system and extending credit to commercial banks.

Regarding the daily operations, Sects. 13 and 14 define the possible scope of discount loans and open market operations. Section 13 requires that discount loans be done only for depository institutions (including US branches of foreign banks). The assets eligible as collateral for discount loans are US Treasury securities, government agency securities, some mortgages, banker’s acceptances, and “notes, drafts, and bills of exchange issued or drawn for agricultural, industrial, or commercial purposes.” A number of financial assets normally considered “investments,” including private equity issues, are not permitted as collateral. Section 14 sets the types of financial assets that can be purchased by the Federal Reserve in open market operations, which primarily encompasses obligations of the US federal government and its agencies.

Significantly, there is no express authority provided in the Federal Reserve Act for the Federal Reserve to purchase corporate bonds, commercial paper, mortgages, equity, or land (Johnson et al 1999; Small and Clouse 2000; Clouse et al. 2000). Rather,

In contrast to bills of exchange ... debt instruments such as corporate bonds and mortgages are “promises to pay”: they are two-party instruments [while a bill of exchange is a three-party instrument]. Thus, [the] first paragraph of section 14 of the Federal Reserve Act places a restriction on the Federal Reserve’s open market operations because the only promises to pay that the paragraph authorizes for purchases or sale are bankers’ acceptances. Because private-sector promises to pay other than bankers’ acceptances are not made eligible for purchase under the first paragraph of section 14 or under any other part of the Federal Reserve Act, there is no express authority under which they may be purchased by the Federal Reserve. Thus there is no express authority for the Federal Reserve to purchase such promises to pay as corporate bonds, bank loans, mortgages and credit-card receivables, for example. Nor is there any express authority for the Federal Reserve to purchase equities. (Clouse et al. 2000, 54)

However, and importantly, Sect. 13 *does* provide for possible purchases of an expanded class of private sector debt instruments under special circumstances, which again recognizes the need for payments system stability (nb3-1) and financial stability (nb3-2) to override other concerns:

The class of private-sector debt instruments eligible for purchase could be expanded to include corporate bonds, mortgages, and other instruments under section 13(3) of the Federal Reserve Act. Under 13(3), if the Board of Governors found there to be “unusual and exigent circumstances” and voted by a majority of at least five governors to authorize lending under 13(3), the Federal Reserve could discount [that is, make discount loans] to individuals, partnerships, and corporations “notes, drafts and bills of exchanges indorsed or otherwise secured to the satisfaction of the Federal Reserve Banks ...” This broadening of the class of instruments eligible for discount would correspondingly broaden the class eligible for purchase. (Johnson et al 1999, 27n)

In other words, by expanding the class of institutions eligible for receiving discount loans from depository institutions to include firms and households, through the first paragraph in section 14 an expanded class of assets would be eligible for open market purchases whenever the Board of Governors decides conditions are “unusual and exigent.” This obviously has been a significant provision in the FRA during the most recent difficulties in the financial system.

The limitations placed upon open market operations and discount lending in the FRA are frequently explained by reference to NB2 (market efficiency). That is, the Fed’s daily operations are normally viewed as “interventions in the markets” and thus these “interventions” should be as limited as possible, except for instance in which failing to facilitate stabilization (NB3) is at risk. For instance, in a study drafted by the Fed in 2002 regarding potential “alternative” operations (that is, operations different from standard practice) permitted by the FRA for use in the event that more standard or typical uses of the discount window and open market operations became “ineffective,” the authors set out market efficiency (NB2) as one of four primary evaluative criterion derived from the FRA. In their words,

In general, market price mechanisms allocate resources most effectively when undistorted by government actions. (Federal Reserve System Study Group on Alternative Instruments for System Operations 2002, I-3)

The monetary mission of the Federal Reserve is statutorily cast in terms of macroeconomic outcomes. In contrast, outcomes for specific sectors and for relative prices of credit or assets are within the purview of private markets and fiscal policy... . The broad mission of monetary policy and its transmission through the reserves market, together with the desirability of allowing private decisions to allocate credit, imply that, the Federal Reserve, *in choosing its portfolio composition*, should attempt to minimize effects on relative asset prices. (I-3; emphasis in original)

However, conducting monetary policy operations requires designating instruments and counterparties, thus potentially giving those instruments and counterparties at least some advantage over others. While fulfilling its needs to acquire assets, the Federal Reserve should avoid as best it can any such favoritism. Not only would the favoring of specific entities in the private sector distort resource allocation, but even appearing to influence relative asset prices in the financial sector through asset selection might invite pressure from special interest groups to achieve specific outcomes. (I-3, I-4)

From this, it is clear that sub-criteria nb2-1 (markets efficiently price risk and allocate funds) and nb2-3 (government intervention can create moral hazard) significantly influences the context within which the Fed views its mandate for carrying out its daily operations.

The belief that the central bank controls the money supply (NB1) had been a guiding tenet of the Fed's public statements regarding its tactics since the 1920s when the Fed "discovered" open market operations as a policy tool (e.g., Bindseil 2004; Meulendyke 1998). However, the DIDMCA even more explicitly embedded both the belief in central bank control over the money supply (NB1) and market efficiency (NB2) as major norms related to the Fed's daily operations. Regarding the former, the DIDMCA directed the Fed (and thereby gave it the authority) to set reserve requirements for all commercial banks, whether Fed members or not (i.e., the state banks), in order to enable better control over the money supply. The DIDMCA sets specific ranges for the Fed to set reserve requirements on transaction accounts (3% minimum on deposits below \$25 million, 8–14% on deposits beyond that), savings accounts (same as for transaction accounts), and time deposits (0–9%). These were enacted for the sole purpose of increasing the amount of reserves "to a level consistent with the conduct of monetary policy" in accordance with nb1-1, nb1-2, and nb1-3 and as described in the money multiplier framework. Regarding market efficiency (NB2), the DIDMCA required the Fed to charge banks for its services related to processing and settling payments, which had heretofore been provided free of charge to banks, primarily in order to promote private sector payment clearing and settlement. In promoting private sector payment clearing and settlement, the DIDMCA required the Fed to price its services not just based upon its costs but also required the Fed to determine its imputed cost of capital (as in a shareholder's required return to capital) and add that to its operating costs in setting prices its services. Regarding sub-criteria, this is based upon nb2-1 and nb2-2.

Rules, Regulations, and Requirements in the Fed's Daily Operations

Table 2 presents a list of some of the more important rules (denoted as ri , for $i = 1, 2, 3$, and so forth), regulations (rgi), and requirements (rq_i) in the Fed's daily operations, within the context of institutional authorities (Congress/President (IA1-1) and the Fed (IA2-1)) and processing institutions (the New York Fed's Open Market Desk (IP-1), Banks (IP-2), Primary Dealers (IP-3), and Private Payment Clearinghouses (IP-4)). The following discusses these in relation to the Fed's discount lending, management of the payments system, reserve requirements, and open market operations.

Discount Lending

As described above, the FRA (r_1) sets out a number of guidelines for the Fed's discount lending to banks. The Fed's Regulation A (rg_1) lays out its policy regarding these loans, including required collateral, interest rates, and maturities. Since 2003, the Fed has provided collateralized loans, mostly on an overnight basis, to banks at a rate set as a "penalty" above the federal funds target rate. This replaced a long-standing policy of lending at a rate slightly below the target rate, but with the added condition that a bank had already attempted to attain credit from other sources. The latter were frequently referred to as the Fed's "frown costs," as it made no secret of the fact that it "frowned" on banks taking out discount loans for anything other than seasonal liquidity needs. The changes to Regulation A since 2003 eliminated the "frown costs" and enable all banks in good standing to borrow at the "primary credit" rate set initially at one percent above the target (since fall 2008, this has been reduced to 0.25% above the target rate); other banks are generally offered "secondary credit" at an additional penalty that is currently 0.5%. The basic requirements and procedures banks must follow for establishing and maintaining an account at the Fed are provided in the Fed's Operating Circular No. 1, while the various collateral requirements and lending rates are spelled out in the Fed's Operating Circulars No. 10 and No. 8 (Operating Circulars are listed as rq_1 in Table 2). Step by step guides regarding how banks go about receiving credit from their regional Fed Bank are also provided and updated in real time on a website maintained by the Fed (www.frbdiscountwindow.org, which is rq_2 in Table 2).

Payments Clearing and Settlement

The FRA (r_1) directs the Fed to make stability in the payments system (nb_3-1) a priority for the Fed's operations. As the Board of Governors puts it, "a reliable payments system is crucial to the economic growth and stability of the nation. The smooth functioning of markets for virtually every good and service is dependent

Table 2 Institutions, rules, regulations, and requirements in the Fed's operations

Higher authorizing institutions (IA1)	Rules (r)	Lower authorizing institutions (IA2)	Regulations (rg)	Requirements (rq)	Processing institutions (IP)
IA1-1. Congress and the President	r1. Federal Reserve Act		rg1. Regulation A rg2. Regulation J rg3. Pricing Principles	rq1. Operating circulars rq2. www.frbdiscountwindow.org rq3. Account Management Guide rq4. www.frbsecurities.org rq5. Payments System Risk Policy Reference Manual and Guide	IP2: Banks
	r2. Depository Institutions Deregulation and Monetary Control Act	IA2-1. FOMC, Board of Governors, and Fed Banks	rg4. Payments System Risk Policy rg5. Regulation D	rq6. Reserve Maintenance Manual rq7. www.reportingandreserves.org	
	r3. Garn-St. Germain Act		rg6. Authorization for Domestic Open Market Operations	rq8. FOMC Directive	IP1. New York Fed's Open Market Desk

upon the smooth functioning of banking and financial markets, which in turn is dependent upon the integrity of the nation's payments system" (Board of Governors 1990, 2). To facilitate stability, the FRA authorizes all commercial banks, government agencies, government sponsored agencies, and several other institutions to have access to reserve accounts at the Fed. The DIDMCA (r2) in fact required the Fed to provide the same access to Fed reserve accounts and to all of the Fed's payment services that Fed member banks already have to all non-member banks.

It is useful here to define terms, as "clearing" and "settlement" have distinct meanings:

Clearing comprises three main steps: processing payment instruments, delivering them to paying banks, and calculating interbank payment obligations. Settlement involves discharging the payment obligations. To illustrate the distinction between these two functions, consider the clearing and settlement of checks among banks that are members of a clearinghouse. Banks rely on the clearinghouse to perform the clearing function when they exchange checks drawn on each other. Then the clearinghouse calculates the multilaterally netted payment obligations due to and due from each clearinghouse participant. Banks participating in the clearinghouse have various options for settling these obligations. Members of the clearinghouse can agree to settle using cash or more likely the deposit liabilities of a private bank, which might also be a member of the clearinghouse, or through another institution. (Summers and Gilbert 1996, 6)

Because most Federal Reserve services in the payment system combine the clearing and settlement functions, the two terms are frequently used interchangeably when referring to Federal Reserve services (6).

Obviously, though, as the above statement points out, clearing and settlement are not the same. This is most clearly the case with the private sector clearing and settlement organizations that provide clearing but usually only netted settlement that is only finally settled via reserve account debits or credits. As the discussion of the SFM in Fig. 1 earlier in the chapter describes, there are a number of significant private payments systems that use Fedwire or at least bank Fed accounts for final settlement. Beyond settling payments, final netted settlement of trades involving US Treasury securities and obligations of US agencies and government sponsored enterprises also occurs exclusively via Fedwire's book-entry settlement system. Thus, as also noted, total dollar value of payments settled via reserve accounts approaches 20% of *annual* US GDP on an average business day.

Consistent with the goal of stability in the payments system, the Fed provides in Regulation J (rg2) that payments sent from one institution's reserve account to another's reserve account are final and irrevocable "at the time a Federal Reserve Bank notifies the receiving bank that a payment has been credited to its reserve account, regardless of whether the sending bank makes good on the payment request" (Hancock and Wilcox 1996, 871–872). In practice, this means that the Fed provides both intraday overdrafts to banks whenever their reserve accounts are drawn down, while collateralized loans at the regional Fed Banks' discount windows (discount lending) are available if an overdraft cannot be cleared by the end of the business day. For banks, the Operating Circulars (rq2) contain procedures for using reserve accounts to purchase currency from the Fed (Operating Circular 2),

check clearing and float (Operating Circular 3), using reserve accounts to settle Automated Clearing House payments (Operating Circular 4), sending payments via Fedwire (Operating Circular 6), and final settlement of securities using Fedwire's book-entry system (Operating Circular 7). Additional information for banks is available in Fed's *Account Management Guide* (rq3) that also describes procedures for payment settlement and overdrafts, and on a website maintained by the Fed to provide guides and information for utilizing the Fed's payment services (www.frbservices.org (rq4 in Table 2)).

As mentioned, the DIDMCA requires the Fed to charge banks for its payments services, and required the Fed to set pricing principles by September 1, 1980. The Board of Governors thereby set out its *Principles for the Pricing of Federal Reserve Bank Services* (rg3), while the Fed then provides more detailed content for banks regarding up-to-date fee schedules and precise calculation of charges for services in its *Account Management Guide* (rq3) and its informational website on its payment services (www.frbservices.org (rq4)). Recall that an overarching goal of the DIDMCA in requiring the Fed to set fees for its payment settlement services is to encourage the development of private sector settlement systems, a result of the primary belief in market efficiency (NB2). By requiring the Fed to recoup its own costs of providing payment clearing and settlement services plus an imputed cost of capital, the opportunity obviously arises that private sector providers may be able to gain market share by providing banks and other financial institutions with the same clearing and settlement services at a lower price.

Returning to the Fed's overdrafts in promoting "elasticity" in the quantity of reserve balances to enable the settlement of payments, the Fed has since the 1980s been concerned about default risks related to the large quantities of credit it extends to banks while enabling payment settlement to continue as normal. Prior to 1986, the Fed essentially provided these overdrafts as unsecured loans at no cost, and the Fed apparently believed that banks were taking advantage of the underpriced credit (Richards 1995).

By the early 1980s, banks' daylight overdrafts of their reserve accounts had become very large, and regulators recognized that at some point a very large bank might be unable to repay its unsecured, and possibly very large, overdraft. . . . During the period, the maximum value of daylight overdrafts grew as rapidly as the value of transfers, which in turn grew faster than the value of bank liabilities By the early 1990s, daily maximum aggregate overdrafts often exceeded \$150 billion and averaged about \$125 billion. (Hancock and Wilcox 1996, 871)

Starting in 1986 the Federal Reserve imposed limits on maximum daylight overdrafts, and in 1994 it began charging a modest fee, which amounts essentially to an interest charge, for daylight overdrafts beyond a percent of a bank's capital (see Richards (1995) and Panigay-Coleman (2002) for a discussion of the evolution of payments system risk policies at the Fed). It also imposed collateral requirements and caps on total overdraft privileges (beyond which significantly greater penalties are incurred). On an average business day in 2005 the Fed was providing around \$36 billion in overdrafts to the banking system *every minute*, and over \$116 billion during a typical day's peak settlement period near the end of the day (Bank for International

Settlements 2007); researchers found, however, that daylight overdrafts were significantly reduced as a result of the fees, collateral requirements, and caps at the time they were implemented, rising slowly over time to again nearly reach mid-1980s levels around 20 years later but this time in support of a vastly greater dollar volume of payment settlement (e.g., Richards 1995; Hancock and Wilcox 1996; Shen 1997; Panigay-Coleman 2002).

In order to further minimize its own credit risk, the Federal Reserve is very clear in discouraging banks from permitting a daylight overdraft to become an unsecured overnight overdraft by imposing a substantial penalty of 400 basis points above the day's federal funds rate with a minimum charge of \$100 (Federal Reserve System 2007, VI-2). Higher overdraft charges are assessed if an institution exceeds three overdrafts in a moving twelve-month period. Chronic overdraft problems can result in administrative controls. As a result, banks attempt to avoid these unsecured overnight overdrafts at nearly any cost (Clouse and Elmendorf 1997; Furfine 2000).

Within the context of the normative systems analysis, fees, collateral requirements, and caps for overdrafts detailed in the Fed's *Payments System Risk Manual and Guide* (rq5), the *Account Management Guide* (rq3), and on the Fed's informational websites for banks (www.frbservices.org (rq4) and www.frbdiscountwindow.org (rq2)) are requirements that shape bank behavior in the payment system. As a result, banks manage daily reserves closely, and whereas they might have utilized more federal funds trades requiring gross settlement on Fedwire in previous decades to manage liquidity for payment settlement and to perform asset/liability management, they now accomplish a large percentage of both via netted settlement using competing settlement systems (IP-4). Finally, researchers have also found that banks routinely wait to send payments at high payment flow periods during the beginning and end of the business day since an overdraft cleared within a minute does not count as an actual overdraft according to the Fed's Payments System Risk Policy (McAndrews and Rajan 2000; Armantier et al. 2008).

Reserve Requirements

The DIDMCA (r2) requires the Fed to set reserve requirements. The Fed has laid out its policies on reserve requirements in Regulation D (rg5) of the Federal Reserve System. Regulation D prescribes a computation period during which banks' end-of-day deposits and holdings of vault cash are averaged over a two-week period; a bank's reserve requirement is then the relevant reserve requirement ratio multiplied by its average deposits held during the period less its average vault cash holdings. Regulation D then prescribes a two-week maintenance period beginning seventeen days after the end of the computation period during which time banks are obligated to hold end-of-day average balances in their reserve accounts equal to or greater than their reserve requirement. A bank deficient in meeting reserve requirements for a given maintenance period will be provided with a loan to cover the deficiency by the Fed and be charged the Fed's collateralized loan rate plus one percent. The Fed publishes a *Reserve Maintenance Manual* (rq6) for banks

that explains in detail how reserve requirements are calculated and met, and also explains various technical details and adjustments that might be necessary in a number of specific instances (Federal Reserve System 2008). The Fed also publishes updates to its manual in real time and offers additional day-to-day reserve requirement management procedures on a special website for banks (<http://www.reportingandreserves.org> (rq7)).

Open Market Operations

The FOMC's annual Authorization for Domestic Open Market Operations (rg6) is the source of the New York Fed's Open Market Trading Desk's (IP-1; hereafter, Desk) authority for purchasing different types, quantities, and maturities of financial assets in its open market operations. The FOMC delivers instructions in its directive (rq8) after each FOMC meeting, which since 1988 has set the target for the federal funds rate that the Desk then attempts to achieve via its open market operations.

Timeliness in the Fed's Daily Operations

This section is based on Fullwiler (2003), albeit in revised and updated form here, which applied "time" and "timeliness" as defined in Hayden (2006, Chap. 8) to the Fed's operations. Hayden defines time within the context of a given system as a series of event sequences. Time or the particular sequencing of events within any socio-economic system is unavoidably framed by the normative characteristics of the system that define the rights, obligations, permissions, and prohibitions. The event sequences in the Fed's daily operations are similarly and unavoidably linked to the primary beliefs, sub-beliefs, rules, regulations, and requirements that provide the context for interactions among various institutions involved in these operations. The point of policy in any socio-economic system, though, is to effect instrumentally efficient outcomes for that system. The normative criteria established by policy makers to influence system behavior ought to therefore be enhancing or at the very least consistent with the manipulation of event sequences such that outcomes or consequences are consistent with normative policy goals. The successful design and implementation of normative criteria at various levels of the socio-economic system is referred to by Commons (1995) and by Hayden (2006) as "timeliness." The overarching goal of timeliness thereby suggests the system's dynamic stability during a given sequence of events, while recognizing, of course, that "stability" and other terms such as "optimal" or "efficient" often used to describe outcomes have meaning only within the normative context.

From a tactical standpoint, timeliness within the Fed's daily operations is currently defined by the Desk's (IP-1) ability to achieve the FOMC's target rate. Doing so is considered consistent with stability (NB3) in the payments system (nb3-1),

the financial system (nb3-2), and the macroeconomy (nb3-3). The Desk (IP-1) regularly announces, for instance, that “the [FOMC’s] objective for the [federal] funds rate will be achieved if the rate is sufficiently certain to trade close to the indicated target over the long run, so that temporary deviations from the target do not influence other asset prices” (Federal Reserve Bank of New York 1999, 2). Consistent with minimizing deviations in the federal funds rate, the Desk attempts to keep volatility in the rate at low levels, too. As former Fed Governor Laurence Meyer (2000, 4) suggests, “A significant increase in volatility in the federal funds rate ... would be of concern because it would affect other overnight rates, raising funding risks for most banks, securities dealers, and other money market participants.” This view is also backed by a good deal of published empirical and theoretical research in monetary economics, which suggests that such volatility would become problematic “if [it were] transmitted to maturities which are deemed directly relevant for decisions of economic agents” (Bindseil 2004, 100–101).

Central to understanding how the Fed’s daily operations function within the normative context described in this chapter to this point is an understanding of double-entry accounting (T1) for the balance sheets of the Fed and banks, and most importantly how it relates to reserve balances. Table 3 presents the components typically found on the Fed’s balance sheet. Due to double-entry accounting, both sides of the balance sheet must equal; more importantly in this case, only changes to either assets or liabilities aside from reserve balances can affect the quantity of reserve balances. This means that, for the aggregate banking system, only changes to the Fed’s balance sheet can affect the system-wide quantity of reserve balances. Individual banks may lend or borrow reserve balances in the federal funds market or other competing money markets, but these activities can only shift existing reserve balances between banks, not alter the aggregate quantity. In other words, the Fed is the *monopoly supplier* of aggregate reserve balances held in reserve accounts via changes to its balance sheet. Several economist have recently taken to labeling accounting identities such as this one (i.e., aggregate reserve balances held in reserve accounts = Fed assets – Fed liabilities other than reserve balances) as “operational” realities, as they are true by definition, and necessary for any relevant, real-world analysis.

The operational realities of double-entry accounting (T1) must similarly be applied to reserve accounting for individual banks in the loan-creation process. As is well known by economists familiar with the literature on endogenous money,

Table 3 Items commonly found on the Fed’s balance sheet

Assets	Liabilities and equity
Treasury securities held outright	Currency in circulation (including vault cash)
Repurchase agreements	Reserve balances
Loans	Treasury account balance
Float	Foreign accounts
Gold and special drawing rights	Other liabilities
Other Assets	Equity

the creation of a loan by a bank at the initiation of a credit worthy borrower creates a liability on the bank's balance sheet (normally a deposit, but not necessarily) for the borrower on the bank's balance sheet. In other words, in contradiction to the sub-criteria "deposits and reserve balances fund bank loans" (nb1-1), neither deposits nor reserve balances actually fund bank loan creation. Many have difficulty understanding that loans are created "out of thin air," but of course this is what any number of non-bank businesses do daily when they provide trade credit to business customers or offer credit to retail customers. For banks, though, the bank liability created by the loan can and probably will be withdrawn by the borrower, perhaps immediately, and the latter is the key difference from credit creation by non-banks. The borrower generally instructs the bank to make a payment on his/her behalf, and at this point (and not before) the bank's reserve account at the Fed can come into play.

Note, however, that as the bank carries out the borrower's request to deliver funds, the bank may or may not need to debit reserve balances from its own account at the Fed. For instance, if the borrower's payment is going to a current customer of the same bank, then the bank simply debits the borrower's account and credits the receiver's account. Or, if the borrower's payment is to be sent via any number of private wholesale payments systems (IP-4), then recall that the bank is usually only responsible for delivering reserve balances if there is a net debit in its position with the clearing house at the end of the day (or at various points in the day), which again may or may not require the bank to debit its reserve account. And if a debit to the account is necessary as a result of the netted settlement, then recall that Regulation J (rg2) ensures that the payment will be sent and that the bank will receive an overdraft automatically in the case of its account balance turning negative. Finally, if the borrower's payment is to be delivered via Fedwire or any other debit to the reserve account as with ACH payments, then again Regulation J (rg2) ensures an overdraft is provided in the case of the account balance turning negative.

Thus, in every conceivable scenario, and (again) in contradiction to sub-belief nb1-1, neither prior reserve balances nor prior deposits funded the loan. Rather, if the bank needed reserve balances to settle a payment resulting from the loan, the regulations and requirements designed according to the FRA (r1), which itself is the result of belief criteria in support of stability in the payments system (nb3-1), ensured any needed reserve balances for settling the payment were provided via overdrafts (at penalty rates set in the Fed's payments system risk policy (rg4)). Consequently, there is no loan officer anywhere in the US that consults with his/her bank's liquidity manager to see how many reserve balances or deposits the bank has before approving a loan; it is simply not how the real-world loan creation process works. The role of deposits in the bank's decision to make the loan relates to the profitability of the loan; that is, if the bank can increase core deposits as it creates new loans, this is less costly than borrowing from the Fed or in the money markets, and the profit margin on the loan is that much greater. Finally, instead of the quantity of reserve balances, it is the bank regulators such as the Fed (IA2-1), the FDIC (IA2-2), the Comptroller of the Currency (IA2-3), and state bank regulators (IA2-4) that are empowered and charged by Congress and the President (IA1-1) with ensuring that banks hold capital (placing their own shareholders sufficiently at risk

for management's activities) and are not expanding their balance sheets via loan creation in ways that unnecessarily risk insolvency or, even worse, more systemic risks related to instability in the financial system (nb3-2) or the macroeconomy (nb3-3).

In achieving timeliness in the Fed's daily operations, the Desk balances three different forms of time created by the combination of normative criteria and operational reserve accounting identities: *intraday time*, *maintenance-period time*, and *seasonal time*. First, there is intraday time, which refers to the needs of banks to settle payments throughout the day. Of course, intraday overdrafts are provided by the regional Fed Banks, not the Desk. Nonetheless, to avoid the risk of an overnight overdraft, or a collateralized discount loan at the Fed's penalty rate, banks in the aggregate have held a "buffer" of reserve balances that typically changes from day-to-day. Partly, this is also due to the lack of perfect coordination among the several thousand banks in the US system, as national banking systems with more precise coordination of lending between banks holding surpluses and those with overdrafts hold little to no aggregate buffer for this purpose. At the same time, US banks have historically preferred that this buffer be as small as possible, since Congress and the President (IA1-1) would not permit the Fed to pay interest on balances banks held in reserve accounts (the recent change in the law to permit remuneration on reserve account balances is discussed in more detail below).

The end result is a daily demand for reserve balances that is quite interest inelastic at the "buffer" banks desire to hold on a given day. If there are fewer balances in the aggregate, overdraft banks can have difficulty finding surplus banks willing to lend, and the federal funds rate can be bid up until a bank in overdraft turns to its regional Fed Bank for a collateralized overnight loan. At times, the federal funds rate may move well above both the FOMC's target rate and the Fed's collateralized lending rate, as prior to 2003 Regulation A (rg1) strongly discouraged banks from using this source of credit. On the other hand, if more balances are supplied than the desired aggregate "buffer," then banks are left holding more surplus reserve balances than are desired in the aggregate and would not be able to find enough banks with overdraft positions to lend the balances to. Prior to October 2008, the Fed paid no interest on reserve balances, and until November 2008, the rate the Fed paid (hereafter, the remuneration rate) was set below the FOMC's target rate. As a result, the larger than desired "buffer" of reserve balances would result in the federal funds rate being bid below the Fed's target rate.

Recall that the Desk's job is to prevent deviations from the federal funds rate from occurring, on average. The source of the change in the rate could be demand-driven, as in a change in the desired "buffer," or supply-driven, as in a change in some component on the Fed's balance sheet that by definition changes the aggregate quantity of reserve balances. For the demand-driven sources, the Desk attempts to predict these via various technical means, though some changes are as predictable as the days of the week. For instance, Mondays tend to be higher payment flow days than Fridays. Similarly, beginnings and ends of months and ends of quarters tend to be high payment flow days, as well as days on which Treasury auctions settle. On the supply side, the Desk prepares each day a forecast of changes to its

balance sheet, most notably bank purchases of currency (which debits their reserve accounts) and changes in the Treasury's balance at the Fed, but there can also be other significant sources such as changes in float and repurchase operations on behalf of foreign accounts. Regarding the Treasury's balance, the Treasury is the largest transactor in the world (Garbade et al. 2004, 1), and thus flows to and from its account have potentially the largest effects on the quantity of reserve balances. The Treasury therefore maintains a rather complex system of hundreds of accounts in private commercial banks to and from which it transfers balances toward the overarching purpose of minimizing the net effect on reserve balances of the Treasury's total transactions (see Garbade et al. 2004 for a thorough description). The Desk's forecasts of the Treasury's balance are thus enhanced by a conference call with the Treasury regarding the latter's plans and expectations for the day's net flows (Thornton 2003).

The Desk's operations to manage intraday time are short-term repurchase agreements (to temporarily add balances) and reverse repurchase agreements (to temporarily reduce balances). The operations to add balances temporarily far outweigh operations to reduce them, as the Desk's management of maintenance period time and seasonal time (both discussed below) generally leave an anticipated shortfall in the projected difference between the supply of reserve balances and the average demand for them, which it then attempts to manage more precisely at the intraday frequency. Typically the Desk undertakes all of its operations (that is, operations for various maturities) on a given business day early in the morning as settlement from the previous day in the repurchase markets is occurring.

Maintenance period time is related to reserve requirements and Regulation D (rg5). As previously described, a bank is required to hold an average end-of-day balance over the two-week maintenance period at least equal to its requirement. Maintenance-period time has two significant effects on banks' behavior in the federal funds market. First, it raises the overall demand for reserve balances and thereby reduces the likelihood that banks will be in overdraft at the end of the business day. Second, because banks are permitted to meet reserve requirements *on average* during the maintenance period, deficiencies or surpluses on any given day can usually be offset later in the maintenance period. This has the effect of increasing the elasticity of banks' demand for reserve balances on most days compared to the effects of intraday time alone, and provides the Desk with a bit more "room for error" than otherwise would be the case in terms of correctly forecasting the demand and supply for reserve balances and gauging its operations to achieve the target rate. It also provides the Desk with a bit more certainty in forecasting the demand for reserve balances, as Regulation D (rg5) since 1998 has stipulated that reserve requirements are determined prior to the beginning of the maintenance period.

Of course, this added elasticity reduces as the maintenance period continues and the days left for averaging surpluses or deficiencies shrink in number; not surprisingly, researchers have found that volatility in the federal funds rate rises significantly in the latter days of the maintenance period. Thus, the Desk's operations related to maintenance-period time must recognize that (1) while there is more "room for error," significant over- or under-shooting by the Desk in providing daily

reserve balances will still create deviations in the federal funds rate from the FOMC's target, and (2) by the end of the maintenance period, much like intraday time, the aggregate demand for meeting reserve requirements becomes very inelastic and significant system-wide surpluses or deficiencies will bring large deviations from the FOMC's target rate until banks eventually (in the case of deficiencies) borrow from the Fed at the collateralized loan rate (or end up deficient and receive a Fed loan at one percent above the collateralized loan rate) or (in the case of system-wide surpluses) bid the rate down to the remuneration rate. As with intraday time, the Desk's primary tools for managing maintenance period time are short-term repurchase agreements (reverse repurchase agreements are rare for maintenance-period time), though these are frequently of a bit longer maturity, varying between overnight and several days.

For seasonal time, the Desk's operations offset changes in the Fed's balance sheet that are larger and longer lasting in their effect on the quantity of reserve balances in circulation than simply a day or a maintenance period. The purpose in this case is to leave a much smaller volume of operations to undertake at the intraday and maintenance period frequencies. As with intraday time and maintenance period time, the primary sources of changes in the Fed's balance sheet are currency in circulation and the Treasury's balance. Regarding the former, more permanent increases in the public's desired holdings of currency lead the Desk to conduct outright purchases of Treasury securities. Less permanent variations, such as the typical rise during the shopping season at the end of the year and the significant dip after the beginning of the year, result in longer-term repurchase agreements, the maximum length of which are set in the FOMC's directive (rq8). The Treasury's account balance tends to rise as important tax dates arrive and for some time thereafter as payments to the Treasury net of outflows can grow larger for some time than the maximum capacity in its accounts in private commercial banks. Again, the Fed uses repurchase agreements at a variety of maturities to offset add reserve balances and thereby offset the reserve drain caused by net tax revenues. Lastly, because the Treasury issues securities when it runs deficits, this aids the Desk by eliminating the need for the Desk to do the same to support the FOMC's interest rate target (since a deficit would by definition add more reserve balances than it drained).

Overall, the Fed's operations have been able to weather several minor or even major crises that otherwise might have brought significant disruption to the payments system and the financial system. For instance, during the months and weeks leading up to Y2K in late 1999, the public increased their holdings of currency by more than \$100 billion, while there was also significant uncertainty among financial institutions regarding the effects of Y2K on private settlement systems. The Fed was able to rather seamlessly provide for the additional desired currency, and the Desk was able to use repurchase agreements to maintain the quantity of reserve balances such that, aside from the last few weeks of the year, there was little deviation in the federal funds rate from the FOMC's target (and the deviations in this case were not much greater than is usually the case during late December, as a number of seasonal factors and intraday factors regarding the demand and supply

of reserve balances come into play). The Desk also offered call options to protect financial institutions from the possibility of significant increases in the federal funds rate in the event if the millennium date change proved to be chaotic. The date change came and went without event, and the Desk then again rather seamlessly offset the \$100 billion increase in reserve balances caused by the reduction in desired currency holdings mostly via reverse repurchase agreements that occurred in the first few weeks of the year.

The Fed was also able to avoid serious problems in the payments system in the days and weeks following the terrorist attacks in September 2001. As the attacks created significant uncertainty with regard to the private settlement of payments, the Fed was able to raise the quantity of reserve balances circulating via overdrafts, discount lending, and repurchase agreements (by the Desk) by more than \$130 billion on demand (McAndrews and Potter 2002). And when this temporary increase in balances then also resulted in rising deposits and thus rising reserve requirements for the next several weeks, the Desk was able to quite easily accommodate this increase without significant effect on the federal funds rate.

The Fed was able to achieve timeliness in its operations in the face of these events because the institutional structure designed by the FRA (r1) and related regulations and requirements were consistent with the primary goal of promoting and sustaining stability (NB3) within the payments system (nb3-1) and the financial system (nb3-2). The overarching goal spelled out in the FRA (r1) of ensuring an “elastic” currency has been achieved in terms of both the Fed’s and the Desk’s abilities to expand the quantity of reserve balances and currency circulating to meet the private sector’s requirements for settling payments and obtaining overnight finance.

On the other hand, the proliferation of retail sweep accounts during the mid-to-late 1990s provides an example where there is less consistency in the normative structure within which the Fed operates daily and thus timeliness was much more difficult to maintain. The financial innovation of retail sweep accounts were enabled by computer software that allow banks to track the account activity of individual customers and “sweep” unused balances into money market deposit accounts (MMDAs), which were “invented” by the Garn-St. Germain Act of 1982 (r3 in Table 2). The Garn-St. Germain Act stipulates that banks are not required to hold reserves against MMDAs, so retail sweep accounts had the effect of reducing bank deposits (as deposits were “re-labeled” as MMDAs at the end of the business day) and reducing required reserves. By the end of the 1990s, deposits had fallen by nearly 50%, and so many banks were able to meet reserve requirements via normal vault cash holdings that reserve requirements fell in kind to the point that they were essentially voluntary (Anderson and Rasche 2001).

The difficulties arose because with the decline in reserve requirements and reserve balances came an increase in the likelihood that banks would end the day with difficulties clearing overdrafts. In other words, the role of intraday time was magnified in the Desk’s operations, and its room for error in achieving the target rate normally provided by maintenance period time was greatly diminished. With a decreased overall demand for reserve balances, and a more inelastic demand as well, small deviations from banks’ desired “buffer” for settling payments (which

now could frequently outsize banks' aggregate required reserve balances) could lead to large swings in the federal funds rate away from the FOMC's target. Furthermore, through the summer of 1998, Regulation D (rg5) had set the maintenance period to overlap the computation period almost completely, except for the last two days for the former; this was primarily in accordance with the sub-belief that reserve requirements provide the Fed with control over loan creation and thus money supply growth (nb1-2), since in the money multiplier model greater monetary control can be had if banks' reserve requirements can be more directly tied to the quantity of reserve balances. In reality, though, the effect was to significantly reduce the Desk's ability to correctly forecast the demand for reserve balances related to reserve requirements. And while Regulation A (rg1) set the collateralized lending rate below the FOMC's target prior to 2003, because the Fed strongly discouraged banks from utilizing this source of overnight liquidity via its "frowning," the federal funds rate could move well above its target range before banks in overdraft would think to turn to the Fed for a collateralized loan. Finally, as mentioned previously, until late 2008 the Fed was prohibited by Congress from paying interest to banks on reserve balances (this is discussed in more detail in the following section but is related to both the neo-Jeffersonian view of banks (NB4) and the widely held view that there are financial constraints on the federal government (NB5)), which would have reduced banks' desire to economize on their holdings of reserve balances and thereby raised the aggregate "buffer" banks were willing to hold at the FOMC's target. The effect of a larger desired "buffer," given that it would necessarily be accommodated by the Desk, would have been to reduce the likelihood of large numbers of banks ending the day in overdraft; this would have reduced the likelihood of large increases in the federal funds rate beyond the FOMC's target, while at the same time it effectively would have put a floor on how far below the FOMC's target rate the federal funds rate could be bid down in the event that the Desk "overshot" in its estimate of how many reserve balances to supply through repurchase agreements.

As a result of these factors, the federal funds rate became exceptionally volatile and frequently deviated significantly from the FOMC's target rate. The Fed's response was to alter both Regulation D (to begin the maintenance period 17 days after the end of the computation period) and Regulation A (to raise the penalty rate to one percent above the FOMC's target while ending the practice of "frowning" on banks that desired to obtain overnight collateralized credit) in 2003, while the Desk also put more emphasis on intraday forecasts than previously. And while the Fed was at that time not yet permitted to pay interest on reserve balances, it was able to encourage banks to hold greater numbers of "required clearing balances," which were voluntary agreements banks made with the Fed to hold a pre-determined (by each bank individually) quantity of balances during the maintenance period; these balances would earn "credits" equivalent to the FOMC's target rate that could be used only for paying off fees incurred by using the Fed's payments services. Since they could only be used for paying these fees, there was a limit to the quantity of required clearing balances each bank would hold, but nonetheless

these agreements with the Fed raised the quantity of reserve balances circulating and thereby somewhat reduced the likelihood of large numbers of banks ending the day in overdraft.

By 2004, the Fed reported that volatility in the federal funds rate had been reduced significantly, partly as a result of the steps taken above, and partly as a result of the fact that the FOMC's target rate had been reduced so much that banks' opportunity costs of holding reserve balances had declined and so their desired "buffer" had increased (e.g., Federal Reserve Bank of New York 2008). What is significant to note here, though, is how the goal of stability in the payments system (nb3-1) and financial system (nb3-2), which are partly reflected by the volatility in the federal funds rate, became inconsistent with regulations and requirements in place that had been intended to enhance the Fed's control over the money supply (NB1), encourage banks to use alternative sources of liquidity (NB2), discourage subsidization of banks (NB4) and government outlays (NB5) via interest payments on reserve balances (NB4). It is also not a coincidence that volatility in the federal funds rate eventually diminished as more and more changes were made to rules and regulations that were increasingly consistent with the goal of stabilization (NB3) in the payments system (nb3-1) and the financial system (nb3-2) and less concerned with the other major beliefs.

General Principles for the Fed's Operations

Given the foregoing description of the Fed's operations derived from the SFM-A, a number of "general principles" are clear, some of which are counter to traditional monetary theory (see Fullwiler 2010 for a more detailed discussion of these and other "general principles" of central banking within a comparative context) and even counter to some of the important beliefs in Fig. 1. This section briefly describes seven such principles.

The Fed's Daily Operations Are Mostly About the Payments System, Not Reserve Requirements

Consider a world with no reserve requirements and no maintenance-period time. In this case, banks hold reserve balances only for the purpose of settling payments. The demand for aggregate reserve balances is very interest inelastic; if the Fed, as the monopoly supplier of reserve balances, provides more or fewer balances than banks desire to settle their payments results in large swings in the federal funds rate. This is because beyond the desired "buffer" of aggregate balances, banks have no need for more (since loans create deposits by double-entry accounting (T1)) and will be forced into overdraft and to the Fed for a collateralized loan if too few are provided.

Adding reserve requirements and maintenance-period time means banks now hold reserve balances to settle payments and also to meet reserve requirements. The maintenance period gives the Desk more “room for error” in accommodating the demand for reserve balances. But by the end of the maintenance period, just as without maintenance-period time, the Desk must accommodate an inelastic demand for reserve balances. Although most learn of central bank operations first via consideration of reserve requirements, this is backward; the Fed’s obligation to the stability of the payments system (nb3-1) is primary and represents the general case, while the addition of reserve requirements is actually the special case. As an earlier report on comparative central bank operations by the Government Accountability Office put it, “the primary objective of all central banks is to ensure the smooth functioning of their countries’ payments systems” (Government Accountability Office 2002, 2).

The Fed’s Operating Target Is Necessarily an Interest Rate Target. The Money Multiplier Framework Is Inapplicable and Untenable in Practice

Because the demand for reserve balances is very interest inelastic on a daily basis (when payment needs dominate the aggregate demand for reserve balances) or at least by the end of the maintenance period (when reserve requirements dominate), to repeat from the previous principle, supplying more or fewer reserve balances than banks in the aggregate desire to hold will result in the federal funds rate falling to the remuneration rate (if too many balances are supplied) or rising to the penalty rate assessed on collateralized lending from the Fed (if too few are otherwise supplied). As such, a reserve balance “target” would be actually a *de facto* interest rate target at either the remuneration rate or the collateralized lending rate. In practice, a reserve balance operating target would send the federal funds rate fluctuating between these two rates as the demand for reserve balances shifted, sometimes significantly, from day-to-day.

Overall, the operating target is necessarily an interest rate target given the Fed’s obligation to the payments system (nb3-1) and the Fed’s stated desire to minimize volatility in the federal funds rate. Reserve aggregates can be targeted only *indirectly* via manipulation of the interest rate target – though the link between these has shown itself empirically to be rather unreliable since loans and deposits are created at the initiative of creditworthy borrowers whose motivations are often not easily explained by the FOMC’s interest rate target alone. In short, this means, again, that support of the payments system (nb3-1) and financial system stability (nb3-2) are primary, while beliefs related to use of Fed operations and reserve requirements to enable more direct control over the money supply (NB1 and nb1-2, nb1-2, nb1-3) are essentially inapplicable if not counterproductive to achieving stabilization. Of course, again, due to double-entry accounting (T1), loans create deposits, and thus neither reserve balances nor deposits can provide additional “funding” for bank lending.

The Fed's Operations Accommodate Banks' Demand for Reserve Balances While Offsetting Changes to Its Balance Sheet Inconsistent with Such Accommodation

As the Fed's target is necessarily an interest rate target, the Fed's operations necessarily accommodate banks' aggregate demand for reserve balances at that target rate. In doing so, its operations must also offset changes to the Fed's balance sheet such as increases in currency in circulation or a rise in tax revenues received by the Treasury, which would (in these cases) reduce the quantity of reserve balances and send the federal funds rate above the FOMC's target. This means that the Fed's operations are largely defensive in nature; the textbook view of a central bank "flooding the economy with money" is inapplicable, as the Fed's balance sheet essentially grows only as banks' demand for reserve balances grow or as the public's demand for currency grows (since this brings forth an open market purchase by the Desk to replenish drained reserve balances). The exception to this is only in the historically exceptionally rare case that the remuneration rate is set equal to the central bank's target rate, as this would enable the Fed to oversupply reserve balances – and thus grow its balance sheet according to its own preferences – without having the federal funds rate fall below the FOMC's target rate. Here again, though, the additional reserve balances would not "fund" bank loan creation, and thus would not be any more inflationary, just as in the previous principles.

Reserve Requirements Have to Do with Interest Rate Targeting, Not Money Supply Targeting

As described above, reserve requirements do not constrain lending, since banks do not use reserve balances to create loans. What reserve requirements *do*, though, is provide the Desk with additional "room for error" in achieving the FOMC's target. Again, beliefs and sub-beliefs related to the proposition that central banks' directly control the money supply (NB1, nb1-1, nb1-2, and nb1-3), as well as rules such as the DIDMCA, are inapplicable and can even interfere with the Fed's ability to promote stability in the payments system (nb3-1) and the financial system (nb3-2).

Potential Deviations in the Federal Funds Rate from the FOMC's Target Rate Are Set by the Fed's Collateralized Lending Rate and the Remuneration Rate

While the Fed encountered difficulty achieving its target rate during the late 1990s as retail sweep accounts proliferated, most of this difficulty was either self-imposed

or imposed by Congress and the President (IA1-1). Uninhibited by such constraints, there is no question about the Fed's "operational" ability to achieve its target rate as precisely as desired. For instance, the Fed's exceptionally high penalty on unsecured overnight overdrafts meant the latter was not an option for banks. A rise in the federal funds rate might have been avoided still as banks could turn to the Fed for a collateralized loan, but the Fed's historical "frowning" on banks obtaining such liquidity from their regional Fed banks led them to continuously bid up the federal funds rate when they were endangered of an overdraft but reluctant to turn to the Fed for collateralized credit. Similarly, as mentioned, the prohibition against paying interest on reserve balances (effectively setting the remuneration rate at zero) both increased the likelihood of overdrafts (as banks economized on reserve balances held to minimize opportunity costs) and meant that the federal funds rate could fall dramatically if the Desk over-estimated the desired "buffer" for banks on a given day.

In contrast, if the Fed sets either the unsecured overdraft penalty or the collateralized lending rate closer to the FOMC's target, and if payment of interest is permitted on reserve balances at a rate close to the target, then the potential volatility in the federal funds rate is obviously significantly reduced. The New York Fed recognized as much when it noted that the elimination of "frowning" and its replacement instead with a one percent penalty on collateralized lending combined with a historically low overall target rate (which, though the remuneration rates was still zero, effectively set a lower bound on the federal funds rate close to the target rate) led to substantially reduced volatility. As it stated,

Volatility in the federal funds rate was exceptionally low in 2003 and 2004, when target rates for federal funds were at historical lows [one percent]. At that time, the gap between the target rate and the lower bound for rates – zero percent [since the Fed does not pay interest on reserve balances] – narrowed substantially which, in conjunction with the primary credit facility adopted in 2003, effectively limited the potential trading range for rates. (Federal Reserve Bank of New York 2008, 21)

Note once again that the lack of timeliness in the Fed's operations during the late 1990s was primarily due to normative constraints in place that were unrelated to the goal of stabilization in the payments system (NB3). Instead, large penalties and "frowning" are more related to instilling "market discipline" on the liability side of bank balance sheets, since it is believed that markets are efficient (NB2) and will efficiently price risk (nb2-1). As previously noted, objections to paying interest on reserve balances arise from concerns that such payment will subsidize banks (nb4-1) or that this will negatively affect the federal government's fiscal position (nb5-1). Again, these normative criteria have led to difficulties for the Fed in achieving its target rate at times, as institutional rules and regulations consistent with norms related to market efficiency (NB2), neo-Jeffersonian views of banks (NB4), and concerns with the federal government's fiscal stance (NB5), can be completely inconsistent with regulations and requirements related to stability in the payments system (nb2-1) and financial system (nb2-2).

There Is No Liquidity Effect Related to the Fed's Operations to Change Its Target Rate

Perhaps no one topic has been more researched in the field of monetary economics than the liquidity effects of central bank operations. A liquidity effect here is defined as operations by the Fed intended to permanently change the target rate. It is clear from the foregoing, though, that a liquidity effect so defined is not at work in the Fed's operations. This is because any attempt by the Fed to unilaterally add or subtract reserve balances to alter the target rate, if not consistent with banks' aggregate demand for reserve balances to settle payments and meet reserve requirements, will simply send the federal funds rate up to the collateralized lending rate (in the case of a deficiency in reserve balances) or reduce it to the remuneration rate (in the case of undesired excess balances). As Sandra Krieger (head of domestic reserve management and discount operations, New York Fed) put it,

The conventional textbook view is that the Trading Desk buys and sells securities in response to easings and tightenings [i.e., the liquidity effect]. From the [Trading] Desk's perspective, however, the supply-demand balance is primarily a function of the demand for required balances, which is almost completely insensitive to small changes in policy. Consequently, any change in the target has no effect on excess supply or demand in the funds market. (Krieger 2002, 74)

Since there is no change in the supply-demand balance for reserve balances with a target rate change, there is no need for open market operations related to a liquidity effect as defined here. The suggestion that a liquidity effect is at work is related to the belief that reserve balances fund loans (nb1-1). But this demonstrates a lack of understanding of double-entry accounting (T1) as it applies to bank loan creation, since it assumes banks can "do" something with additional balances; recall again that reserve balances serve no purpose but to meet reserve requirements and settle payments. Instead of a liquidity effect, then, the Fed simply announces rate changes. This is all the more obvious when one considers an alternative tactic to minimize potential deviations from the target rate in which the Fed leaves a narrow range between its collateralized lending rate and the remuneration rate; in this case, it could simply announce new levels for both rates while the target rate would necessarily remain within this new range.

The Fed's Operations, Overall, Are About "Price," Not "Quantity"

The most common misconception about monetary policy operations is that they are primarily concerned with the quantity of reserve balances in circulation. As explained, though, the Fed's only available operating target is an interest rate target, regardless of whether the spread between the collateralized lending rate and the remuneration rate is large or small. Even during 1979–1982, when the Fed claimed it was not setting an interest rate target, it is widely acknowledged now that in fact

the Fed was simply allowing a wider range for the federal funds rate to fluctuate within than it has during other periods. As the monopoly supplier of reserve balances, this is necessarily the case, since even with such a wide spread the Fed can quite obviously enable, exacerbate, or relieve whatever “pressure” exists for the federal funds rate to rise or fall according to its own preferred outcomes (while any such “pressure” exists in the first place due to the quantity of balances provided by the Fed itself relative to the banks’ system-wide demand for them).

Moreover, the quantity of reserve balances circulating has nothing to do with the Fed’s target rate or its ability to achieve the target rate. Recall that, absent reserve requirements, the quantity of reserve balances simply falls to the “buffer” level that banks desire to hold overnight, with no effect on banks’ abilities to create loans. However, in the presence of an opportunity cost to holding reserve balances (as when the target rate is set above the remuneration rate), the buffer itself is primarily determined by a combination of the penalties banks are faced with for borrowing secured or unsecured from the Fed (since a negligible penalty would lead to less need to hold a buffer against it), the ability of banks to coordinate borrowing/lending between surplus and deficient banks at the end of the business day, and the Fed’s ability to forecast and offset changes to its balance sheet. So, a desired overnight “buffer” of zero would indicate that at least one or more of these factors had been eliminated, rather than being an indication that banks could not lend or that the Fed’s reserve balances were having difficulty “competing” with other means of payment. In Canada, for instance, banks have no reserve requirements, face a penalty of 0.25% on collateralized borrowing from the Bank of Canada, have absolute certainty that they can clear overdrafts or eliminate surpluses by the end of the business day, and the Bank of Canada can with absolute certainty offset any changes to its balance sheet. Perhaps not surprisingly, the quantity of reserve balances banks hold overnight in Canada has been zero for several years, as reserve balances there exist only in intraday form. At the same time, the Bank of Canada has also been able to achieve its interest rate target with significantly greater precision than the Fed.

At the other extreme, if the Fed were to set the remuneration rate equal to its federal funds rate target, it could raise the quantity of excess balances (beyond that desired to settle payments and meet reserve requirements) to virtually any positive level it desired, while still achieving the target rate (Fullwiler 2005; Whitesell 2006; Lacker 2006; Keister et al. 2008). This would also greatly simplify the Fed’s unnecessarily complex daily operations. As Richmond Fed President Jeffrey Lacker explained, “the market funds rate would not rise above the [rate paid on balances] except to reflect borrower-specific risk. The New York Fed staff would merely need to provide an amount of reserves that will be sufficient to oversupply the system with reserves and meet daylight settlement needs. But they would not need to estimate daily reserves” (2006, 3). Since 2006, the Reserve Bank of New Zealand has used a similar procedure (Martin and McAndrews 2008, 20–22). Note, though, that this increased quantity of reserve balances would have no bearing on banks’ abilities to create loans, since – yet again – loans create deposits. As with no reserve balances in circulation, even with a very large surplus of balances, the Fed’s operations are “about” interest rates, not the quantity of reserve balances.

The Fed's Operations and the Recent Financial Crisis

Beginning in August 2007, events related to the problems in “subprime” mortgages – which themselves became readily apparent in the summer of 2006 – started having a substantial impact in the money markets closely related to the Fed's operations. The failure of Lehman Brothers in September 2008 added yet another level to the effects on the Fed's operations. The purpose of this section is to interpret events related to the Fed's operations using the SFM and normative systems analysis developed above. This also provides an opportunity to propose alternative approaches to dealing with such events, and has implications for day-to-day operations under normal circumstances, as well.

Brief Chronology of Events, August 2007 to December 2008

The details and causes of recent events in the US financial system have been covered by many others already, and are beyond the scope of this chapter. This section therefore confines itself to a brief chronology of events from August 2007 to the end of 2008 that are most related to the Fed's operations.

Significant volatility developed in the federal funds rate in late summer through fall 2007 as losses well above those previously expected began to emerge for institutions funding mortgage-related securities in money markets. Historically large spreads developed between the Fed's interest rate target and rates in both Eurodollar and commercial paper markets in August 2007. This reflected the difficulty financial institutions were having obtaining short-term funds as lenders shifted from term to overnight lending due to concerns of counterparty risk. For instance, the one- and three-month LIBOR-OIS spreads, which had been typically around 0.1–0.2%, rose to around a full percent. Commercial paper spreads were even wider. These events created upward pressure on the federal funds rate, according to the New York Fed, which led to a change in the Desk's tactics.

In the first maintenance period in which these pressures appeared, the period ending August 15, the Desk effectively suspended its normal approach to controlling the funds rate. In order to combat severe and persistent upward pressures ... the Desk provided a level of excess reserves above any amount banks would have chosen to hold at rates anywhere around the target. This extraordinary measure was taken to restore a more normal balance between risks of upward and downward rate pressures. (Federal Reserve Bank of New York 2008, 4)

The Fed also responded in mid-August 2007 by cutting the collateralized lending rate to 0.5% above the target rate. Overall,

the ultimate rate effects of the heavy reserve provisions that the Desk provided ... [were] evident in the tendency for the [federal funds rate and other overnight rates] to fall off during the day ... which sometimes contributed to very low rates even early in the morning on subsequent days. For a time, until about mid-September, the Desk's reserve provisions contributed to an overall soft bias in daily average rates, despite a tendency for upward rate pressures to emerge many mornings. (Federal Reserve Bank of New York 2008, 28)

The New York Fed thus reported that for the period from August 9 through September 18 intraday standard deviations, daily trading ranges, and absolute deviations from the target were up substantially from normal levels (Federal Reserve Bank of New York 2008, 28–30).

Thereafter, though, “period-average excess levels were returned to more normal levels in subsequent maintenance periods in the year, [since] financial market strains did not appear to have any material impact on the period-average level of excess reserves that banking institutions wished to hold... .” (Federal Reserve Bank of New York 2008, 8). The corollary was that “since [September 18 through the end of 2007], the Desk has succeeded in maintaining daily rates on average around the target,” (28) while, nevertheless, “volatility around the target, though somewhat dampened, has remained elevated” (28).

During this period, the Fed also lowered its target rate from 5.25 to 4.75% in early September, and then again two more times to 4.25% by the end of 2007. Even with the lower target rate and some success minimizing volatility and deviations in the federal funds rate, after mid-September 2007 spreads in term money markets continued to fluctuate while remaining at levels well above normal. The Fed therefore introduced on December 12, 2007 the Term Auction Facility (TAF) to auction a fixed dollar-value of collateralized loans available to banks at one-month maturities, with the purpose of spreading funds more broadly than typically could be achieved via open market operations. In early March 2008, the Fed also began providing a large number of 1-month repurchase agreements with agency mortgage-backed securities (MBS) as collateral, in order to reduce spreads between Treasury and agency MBS repurchase agreements and provide liquidity to holders of now less-liquid agency MBS.

As Bear Stearns’ failure or takeover became imminent, on March 17, 2008 the Fed lowered its collateralized lending rate to a 0.25% penalty above the target rate. The target rate, which had been lowered to 3% in January, was lowered again on March 18 to 2.25%. On March 17, the Fed created the Primary Dealer Credit Facility (PDCF), which provided overnight collateralized loans at the Fed’s collateralized lending rate to primary dealers. The Fed the previous week had also established the Term Securities Lending Facility (TSLF), which loaned up to \$200 billion in US Treasuries held by the Fed to primary dealers in exchange for a greater dollar-value in other highly-rated fixed-income securities. The purpose here was to enhance dealers’ abilities to obtain credit in private markets (which they could do by lending the Treasuries in reverse repurchase transactions) and also to improve settlement in Treasury repurchase markets that are crucial to overall functioning in the money markets (discussed in more detail below).

In May 2008, the Fed asked Congress for authority to pay interest on reserve balances. Congress did give the Fed authority to do so in the Financial Services Regulatory Relief Act of 2006, but the authority was not to take effect until 2011. The Fed’s rationale was that it needed to expand its balance sheet in order to continue providing overnight and term liquidity at the levels commensurate with difficulties in those markets. During the period of August 2007 through May 2008, the Fed’s balance sheet had remained around \$900 billion in total assets, but there was a significant “reshuffling” of assets, as the TAF, PDCF, and MBS repurchase

agreements had required the Desk to actively reduce its holdings of Treasuries by around \$200 billion in order to achieve the Fed's target rate. The TSLF also reduced holdings of Treasuries by another \$100 billion or so, though these operations were simply security swaps and had no effect upon total reserve balances circulating. In other words, in addition to managing these new facilities, the Desk had to offset all of the reserve affects from these facilities since banks' overall demand for reserve balances had not increased (that is, since the balances could not earn interest, banks minimized their holdings just as in normal times). This was all added to its normal activities of estimating the demand for reserve balances and forecasting balance sheet effects of changes in currency, the Treasury's account, and so forth.

Congress's reasoning in 2006 for delaying interest payment on reserve balances until 2011 was that its budgeting cycle is always five years, so spending related to such interest payment more than five years into the future was not required to be incorporated into a new bill. As previously explained, for years prior to 2006, though Congress had rejected interest payment due to concerns regarding the effect upon the federal government's fiscal position (nb5-1), and also that such interest payment unnecessarily subsidizes banks (nb4-1). The financial press repeatedly replayed both of these reasons in the public discussion regarding reconsideration remuneration for reserve balances in May 2008. Consequently, no action was taken by Congress at that time.

After Lehman Brothers' bankruptcy in mid-September 2008, and subsequent bailouts or buyouts of several other large financial institutions, the worst part of the crisis set in (to date, at least). Strains on the money markets were enormous, as "both term unsecured and secured financing markets ground to a halt" (Federal Reserve Bank of New York 2009, 43). In response, the Fed this time increased its balance sheet size from around \$900 billion at the beginning of September 2008 to \$1.8 trillion on October 16 and then to around \$2.3 trillion by early November, where it remained through December. In doing so, the Fed did not further actively reduce its outright holdings of Treasuries, while it also expanded the TAF and PDCF, and continued other operations at roughly the same levels, such as repurchase agreements with agency MBS and traditional collateralized lending to banks. It further added significantly to its assets via new activities such as currency swaps with more than 14 foreign central banks totaling over \$500 billion (which enabled the latter to provide dollar loans to their banking systems and thereby stabilize offshore dollar money markets); loans to the American International Group (AIG) were valued at around \$50 billion by the end of 2008, and lending facilities for issuers of commercial paper and money market mutual funds totaled over \$300 billion by the end of 2008. Though it did not affect the size of the Fed's balance sheet, the Fed also significantly expanded the TSLF to over \$200 billion (whereas prior to September 2008 it had been around \$50 billion) as "demand for US Treasuries again skyrocketed" and accompanied substantial problems in the settlement of term and overnight repurchase agreements (Federal Reserve Bank of New York 2009, 43-45).

The FOMC further lowered its target rate in early October to 1.5%, and then in late October to 1%. The New York Fed reports that "prior to mid-September, fed funds traded with some volatility but daily effective rates were relatively close to the target rate ...[but] after September 15, volatility increased and funds often traded well below the target rate as the banking system had large levels of excess balances"

(Federal Reserve Bank of New York 2009, 4). In other words, the corollary to the large increase in the Fed's assets was a large increase in reserve balances and therefore a large decline in the federal funds rate relative to the target rate; this was unavoidable since the Fed did not hold enough Treasuries to sell to offset its expanded liquidity and lending operations. Overall, reserve balances rose quickly from around \$20 billion to over \$200 billion in mid-September, and then continuously increased to around \$800 billion by the end of 2008.

The Fed was finally provided with the authority to pay interest on reserve balances in the Emergency Economic Stabilization Act of 2008 effective on October 9. The Fed set the rate on excess balances initially at 0.75% below the target rate, but as the federal funds rate traded well below this level, the remuneration rate was raised to 0.35% below the target on October 22. With the federal funds rate still trading near zero, the remuneration rate was set equal to the target rate, as suggested in research cited above. However, the rate continued to hover near zero, even as the target remained at 1% until December 16. The following from the New York Fed's report explains why:

In practice, a combination of circumstances prevented interest on reserves from working as designed. Several major participants in the fed funds markets, specifically Government Sponsored Entities (GSEs) and some of the Federal Home Loan Banks, are not depository institutions and thus not eligible to earn interest on reserves. As a consequence, they retained incentives to sell fed funds in the market at very low rates to earn some return. Perhaps more importantly, banks were not willing to arbitrage in the funds market to the extent necessary to keep the funds rate close to the target. Absent any balance sheet constraints, banks should be willing to purchase funds at a rate below that paid on excess reserves and earn a risk-free return by holding those balances in their accounts at the Federal Reserve. However, banks only marginally took advantage of this arbitrage as most viewed balance sheet flexibility to be more crucial [than slight income earned on additional overnight liabilities]. As a consequence, the funds rate regularly traded below the interest rate paid on excess reserves. (Federal Reserve Bank of New York 2009, 4-5)

On December 16, the Fed set the interest rate target to a range between 0 and 0.25%. For the Fed's operations, this meant that interest payment on reserve balances was essentially no longer necessary to expand the Fed's balance sheet while achieving the target rate. With no more room to cut the target rate, and with money markets somewhat stabilized, albeit still at historically high spreads (but lower than September 2008 highs), the Fed announced in November its additional plans to aid credit creation in the financial system in which the Fed's newly created Term-Asset Backed Securities Loan Facility (TALF) would begin in March 2009 purchasing \$1 trillion billion in securities backed by newly originated student, auto, credit card, or small business loans.

The Financial Crisis and General Principles for the Fed's Operations

This section relates the above events to the general principles for the Fed's operations that derive from the SFM and normative systems analysis for these operations. There are four issues in particular to discuss here: (1) the substantial variations in the federal

funds rate relative to the Fed's target rate; (2) the defensive nature of the Desk's operations; (3) the importance of the federal funds rate and the unimportance of the quantity of reserve balances; and (4) the payment of interest on reserve balances. In each case, consistent with the general principles, major norms unrelated or inconsistent with stabilization of the payments system (nb3-1) and financial system (nb3-2) that were primary criteria for setting rules, regulations, and requirements are again at best flawed and at worst contributors to the difficulties experienced in stabilizing the payments system and the financial system.

The rise in volatility reported by the Desk, beginning in August 2007 continuing through September 2007, was a direct result of the wide spread historically permitted between the collateralized lending rate and the remuneration rate. The one percent penalty on collateralized lending, while lower than the non-monetary costs previously associated with the Fed's "frowning," was among the highest for central banks. It was not until March 2008 that the penalty was reduced to a level more in line with most other central banks at 0.25%. Partly due to this large penalty (and potentially the reluctance of banks to borrow from the Fed given past history), and probably also partly due to the very high penalties on uncollateralized overnight loans, the Desk felt compelled to substantially oversupply the banking system with reserve balances. This over supply of reserve balances then led the federal funds rate to fall substantially since the Fed was not allowed to pay interest on reserve balances until October 2008. Thus, as the general principles explained, it is the width of the spread between the Fed's overnight lending rate and the remuneration rate that sets the potential swings in the federal funds rate. Under the circumstances, the Desk had very little chance during the worst periods of the crisis to achieve the Fed's overnight target rate, and this was precisely when stabilization of the price of refinancing of short-term funding was one of the most important contributions the Fed could make to stabilization of the financial system.

The Desk's tactics during the August 2007 through early September 2008 period are a rather extreme example of its necessarily defensive operations when the interest rate target is set above the remuneration rate. Many in the financial press did not understand this basic fact, and saw only the increased lending via the multiple programs the Fed designed as evidence of the Fed was "pumping money" into the economy. But in fact, because the overall demand for reserve balances did not increase during this period, and because no interest payment was yet permitted on reserve balances, the quantity of reserve balances therefore also needed to remain the same. The Desk was thereby required to engage in what was essentially an act of juggling, managing various new programs, attempting to forecast demand for reserve balances in an historically volatile environment, and also removing several hundred billion dollars in Treasuries from its balance sheet so that there might be some chance of achieving a federal funds rate close to the target rate.

Since September 2008, as both the Fed's balance sheet and the quantity of reserve balances have risen to historic highs, the financial press has labeled this "quantitative easing" (QE), which the Bank of Japan used (incorrectly) to describe its own actions in the early 2000s. Often forgotten is the fact that the Desk had no choice but to allow reserve balances to rise, as there were no longer enough Treasuries on its

balance sheet to sell as an offset to the Fed's increased lending. The Fed had warned Congress of this possibility in May 2008. More importantly, though, is the general principle that the Fed necessarily sets an interest rate – in this case, with such large excess balances circulating, the rate was effectively zero percent – while the quantity of reserve balances or the size of its balance sheet are irrelevant to banks' "abilities" to create loans. In other words, yet again, the money multiplier view of the Fed's operations (NB1) is inapplicable. Nevertheless, such concerns were widespread in the financial press. A speech by FOMC Chair Ben Bernanke in February 2009 acknowledged these concerns about the size of the Fed's balance sheet (Bernanke 2009), and also correctly noted that most of the loans on the Fed's balance sheet will be self-liquidating once private sources of the same sort of financing are available. But Bernanke, unfortunately, did not point out that these concerns were inapplicable at any rate. While reserve balances held overnight had risen from a fraction of a percent to around 5% of GDP in December 2008, whether this quantity is zero (as in Canada) or 15% of GDP (as in Japan in the early 2000s), reserve balances simply settle payments and meet reserve requirements, while loans create their own deposits. Congressional outrage that banks were not "lending" capital injections received from the federal government's Troubled Asset Relief Program (TARP) was similarly inapplicable and inconsistent with the logic of double-entry accounting (T1): banks do not require capital, deposits, or reserve balances to create loans. Instead, banks increase their lending when they see profitable lending opportunities (which, in the current environment, may be sparse) assuming that their regulators approve the assets and consider the banks to be well-capitalized. As in the general principles, the effect of such large quantities of excess reserve balances being held overnight is that the federal funds rate will fall to the remuneration rate. Since both the target rate and the remuneration rate were already effectively zero percent, the excess quantity had little if any economic significance.

Finally, as the Fed's inability to pay interest on reserve balances was one of the key factors in the volatility and deviations of the federal funds rate from the Fed's target rate, it is useful to consider the argument here that such interest payment harms the government's fiscal position (nb4-1). The traditional argument has been that because the Fed is required by law to remit its profits to the Treasury, and with interest payments these remitted profits would be reduced (e.g., Abernathy 2003). But, consider the case with the greatest potential interest outlays by the Fed in which the remuneration rate is set equal to the Fed's target and a large quantity of excess balances circulates. Under normal circumstances with no financial crisis, such as the scenario envisioned by Lacker above, the Fed would hold on average a greater quantity of Treasuries in order to add a large surplus of balances (or, alternatively worded, a larger proportion of the national debt would now circulate on the non-government sector's balance sheets as reserve balances than would be the case without interest payment). To the degree that the Treasuries now held by the Fed (or at least now not held by the non-government sector) would earn a higher interest rate than the remuneration rate earned on reserve balances now being held by the non-government sector (which would frequently be the case, since Treasuries have longer maturities than reserve balances and the yield curve usually slopes upward),

then the net effect upon the federal government's fiscal position is undeniably positive. Further, under extreme conditions – such as now – in which the Fed raises reserve balances significantly by creating loans to stabilize the financial sector (and then does not drain them as it would have to without interest payment in order to hit a positive interest rate target), to the degree the interest rate charged by the Fed on these loans is greater than the remuneration rate on the increased quantity of reserve balances (which like now would almost always be the case), the total impact upon the federal government's fiscal stance is again positive. In other words, it is simply *not* the case that interest payment on reserve balances hurts the federal government's fiscal position; in fact, the opposite is actually the case. This also shows the folly of the Fed's prohibition against the GSEs and other non-depository receiving interest on reserve balances, since this either means the Desk must drain excess balances by selling Treasuries (which, against Congress's own preferences, *worsens* the government's fiscal position) or leave the excess balances circulating and let the federal funds rate fall well below the target rate (which the Desk did during mid-September to mid-December).

Additional General Principles for the Fed's Operations as a Result of the Financial Crisis

As a result of the financial crisis, there are additional general principles for the Fed's operations that can be articulated. These include (1) the unnecessary interbank market; (2) the Fed's ability to set the term structure of risk-free lending rates; and (3) the role of the Treasury in stabilizing repurchase agreement markets. One might add a fourth principle, which would be that the Fed can set terms of credit in virtually any market it desires, since it is the monopoly supplier of reserve balances.

There Is No Public Purpose Served by the Federal Funds Market that the Fed Could Not Provide in a More Direct and Precise Manner While Also Expending Fewer National Resources

As noted, much like the DIDMCA's (r2) goal of encouraging private settlement systems (nb2-2), the Fed's payments system risk policy (rg4) likewise encourages settlement off of the Fed's balance sheet via overdraft penalties, collateral requirements, and so forth. Consequently,

in practice, the daily operation of the payments system typically involves *sequential* use of [three different money markets]. Repo markets are most active in the (New York) morning when dealers arrange financing for continuing balance sheet positions and settle security trades made the previous day (or two). The Eurodollar market is then most active during the day, and the Fed Funds market is most active at the end of the day. (Mehrling 2006, 25)

An important reason for this structure is the preference for “market discipline” and the presumed benefits of such discipline in terms of efficiency gains (nb2-1).

During the day, elasticity is the objective, and daylight overdrafts at all levels of the system are permitted in order to facilitate payments. But overnight, discipline is the objective and that means that credit expansion is ideally kept off the books of the banking system, and certainly off the books of the central bank. The point is to provide an ongoing incentive for economic agents to settle their debts, and not simply roll them over to the next day. (Mehrling 2006, 25–26)

While these respective interbank markets under normal circumstances are likely as efficient as any in the world in terms of liquidity, depth, and breadth, consider how much government “intervention” is necessary even in this case. First and second, the Fed obviously provides daylight overdrafts at little cost to enable a large percentage of intraday settlement to occur on its own balance sheet and also achieves its own target for the overnight rate in the federal funds market to anchor the other money market rates. Third, the federal government insures bank liabilities, which is only a step or two from the Treasury offering its own accounts to the public; an intermediate step would be deposits in banks that could only invest in Treasuries, but instead banks are allowed to invest in a variety of loans and securities, while regulators regularly evaluate bank assets and the sufficiency of bank capital. And fourth, as recently occurred, the Fed by necessity brings a large amount of this money market activity onto its own balance sheet if the prior three “interventions” are still insufficient to provide stability (NB3).

An alternative approach could be for the Fed to substantially reduce the spread between its lending and remuneration rates, perhaps even reducing it to zero as Mosler (2007) and Goodhart (2008) suggested. Some worry that eliminating or grossly reducing the penalty for borrowing from the Fed would encourage speculative activity among banks, possibly leading to asset price bubbles; however, such concerns neglect that (1) banks must collateralize their loans from the Fed, and (2) banks must submit their asset portfolios to bank regulators for approval on a regular basis. A related concern might be that eliminating such a penalty subsidizes banks (nb4-1) because central bank liquidity is effectively free (banks borrow from the Fed at the same rate they can invest the funds with the Fed), but of course bank liabilities are already effectively subsidized in that they are guaranteed by the federal government (enabling banks to acquire them for little to no interest cost in most cases), while, again, banks can only earn profits from investing in regulator-approved financial assets.

Instead of subsidizing banks, substantially reducing or eliminating the spread would further enable the smooth functioning of payment settlement (nb3-1) while also having the potential to remove a large degree of perceived counterparty risk in the financial system during a crisis (nb3-2). Indeed, it was precisely the Eurodollar and repurchase agreement markets for which the Fed encourages netted payment settlement during the day (and also the commercial paper market) that “ground to a halt” due to increased concerns regarding counterparty risk.

Another concern for some is that eliminating the opportunity cost of holding reserve balances by setting the target rate equal to the remuneration rate subsidizes banks (nb4-1) and eliminates their incentive to lend to other banks. Regarding subsidization, it is true that this would eliminate the “tax” on banks of holding reserve

balances and thereby reduce their need to economize on their holdings. But with a reduced spread, any bank needing to borrow funds obviously can obtain balances from the Fed at the same rate they would borrow from another bank, so there are no additional profit opportunities available to banks holding excess balances in this case. Further, while any bank that simply acquires deposits and invests in reserve balances would now earn more than previously for the same activities, it is difficult to see why this would be a problem since this would be an extremely safe strategy (the equivalent of 100% reserve banking) while at the same time the strategy would be far less profitable (particularly after non-interest costs and taxes were deducted) than the traditional practice of holding a portfolio of regulator-approved loans and securities.

How would a reduced spread work in practice? Consider, as an example, an overnight reserve “market” in which the spread is zero or close to zero, and in which the Fed perhaps oversupplies significantly the banking system with reserve balances as in Lacker’s (2006) suggestion above. In this system, the target rate is achieved at all times, banks are able to settle payments with a minimum of intraday or overnight credit in the case of an oversupply of balances (as an alternative to the Fed’s payments system risk policy (rg4)), and there is no counterparty risk among banks given that each can access funds from the Fed at no penalty above the target rate. If, as the Fed apparently believes would happen, there are too many banks that are “not settling their debts,” then Goodhart’s (2008) suggestion that the spread be widened for individual banks after outstanding overdrafts reach a certain amount could be considered. Alternatively, perhaps the Fed could instead operate a clearinghouse via reserve accounts throughout the day or at the end of the business day, as the Bank of Canada already does, such that banks with overdrafts could be matched with banks in surplus, leaving only whatever net balances have been supplied by the Fed’s open market operations. Or, to again remain somewhat in the spirit of Canada’s interbank market and settlement system, the Fed could do both, leaving a modest spread to encourage banks to settle their overdrafts beyond a certain level while also acting as counterparty. The Fed as interbank clearinghouse and counterparty for all banks has been suggested by others (such as Kregel 2008) as a relatively simple change that would have significantly softened money market disruptions driven by concerns over counterparty risk. This is a “relatively simple change” since, for the Fed, the role is a natural one, as it already is the banker to all commercial banks, provides their intraday overdrafts and their overnight collateralized loans, operates the Fedwire payments system most commonly used by all banks for final settlement of payments and securities transactions, and is a bank regulator. That the Fed has not yet officially taken on this role has to do with major norms that favor market efficiency (NB2) via private settlement (nb2-1), market discipline and credit allocation (nb2-2) and less government “intervention” (nb2-3), which have led to rules, regulations, and requirements that have promoted the settlement of payments off the Fed’s balance sheet.

Finally, a common mistake related to the arguments in favor of market efficiency or market discipline in the federal funds market (nb2-1) is not recognizing that there is no useful role in this particular case for price discovery. As Martin and McAndrews (2008) explain,

The costs of reserves, both intraday and overnight, are policy variables. Consequently a market for reserves does not play the traditional role of information aggregation and price discovery. In fact ... many demand-management features determined by central bank policy are intended to dampen price variability in the market for reserves. (1)

One could go even further, since the Fed necessarily sets an interest rate as the monopoly supplier of reserve balances, so any price variation not dampened and providing the appearance to some of “price discovery” occurring in the federal funds market is instead an indication of an error in the Desk’s estimation of reserve demand, or otherwise an indication of how much of a “trading range” for the federal funds rate the Fed is willing to allow (as during 1979–1982). The corollary here is that there is little rationale for economically significant penalties on borrowing from the Fed or opportunity costs for holding balances in Fed accounts, as they contribute virtually nothing to, and can even be counterproductive to, the goals of stability in the payments system (nb3-1) and the financial system (nb3-2). Instead, as Mosler (2007) argues, “when the [central banks] fully understand their own monetary operations ..., they will offer unlimited funds at or just over their target rates and ... bid for funds at or just under their target.” As above, the Fed then becomes effectively the counterparty to banks in the final settlement of payments and trades. And because the Fed *already is nearly that* except for the influence of norms that favor settlement of payments and trades off the Fed’s balance sheet, as Martin and McAndrews (2008, 24) put it, “under this view, activity in the [interbank market] is a waste of resources.” Even worse, in the recent crisis, not using the Fed as a counterparty in settling banks’ payments needlessly hampered attempts to stabilize the financial system.

The Fed Can Set Money Market Rates for Banks at Any Point in the Term Structure

In the first few months of the crisis, the Fed did not recognize its own ability – as monopoly supplier of reserve balances – to control interest rates along the term structure by intervening in term lending markets that were experiencing substantial difficulties. As money market spreads widened for a large percentage of banks in good financial standing, the Fed only in December 2007 began offering term loans to all member banks through the TAF, and even then had to continue raising the quantity of lending made available throughout 2008 as the quantity of funding offered each time was fixed. Similarly, the rates on the TAF loans were allowed to float via auction, even as they were ultimately lower than those in private term money markets.

Note that the point of the Fed’s operations to achieve a target rate is not to simply achieve an overnight rate target, but rather to influence via this target other interest rates set in other markets. This aids financial stability (nb3-2) by stabilizing the price of refinancing of short-term funding under normal circumstances when it is generally accepted that simply setting the federal funds rate can be consistent with stable, modest spreads in other money markets. But this process has not worked as normal since August 2007, as spreads in several money markets remain at historical highs.

To this day, it is unclear if the Fed realizes it could have stabilized costs of refinancing short-term funding significantly in the financial system by simply setting lending rates to banks at one-, two-, and three-month maturities, for instance, that were equivalent or slightly higher than the spreads the Fed desired to see in the respective term lending markets. While some have noted that the TAF appears to have reduced spreads in term markets, this is not the same as recognizing that the spread was a potential policy variable, while spreads have remained at historical highs at any rate.

The Treasury Can Supply Unlimited Amounts of Treasuries to Help Stabilize Settlement and Reduce Counterparty Risk in Repurchase Agreement Markets

As the Federal Reserve Bank of New York (2009, 41) reports, “amid ongoing concerns about counterparty credit risk and increased risk aversion, demand for Treasury collateral was extremely elevated during several episodes throughout the year... . This occurred in spite of the sizable amount of Treasury collateral that was available in the market through primary issuance, the [Treasury’s Supplementary Financing Program], and other programs geared towards improving functioning in Treasury markets.” This was a repeat, albeit on a significantly larger scale, of Treasury shortages in March 2008 at the time of Bear Stearns’s failure (and these shortages have appeared in most instances of financial system strain during the past decade, as well). The Fed’s response in both cases was to accept more forms of non-Treasury collateral for its standing facilities (in order to reduce the amount of Treasuries held as collateral by the Fed, freeing them for use in repurchase markets) and to first establish and then increase the size of the TSLF.

An additional or alternative option would be for the Treasury – which is obviously the monopoly supplier of Treasuries – to offer to lend any of its previous issues at a fixed spread (such as 0.25%) below the federal funds rate target. And given the extreme circumstances, as the owner of the Fannie Mae and Freddie Mac GSEs since August 2008, the Treasury could, like the TSLF (or as a more effective replacement for it), have offered to lend Treasuries against GSE obligations. While repurchase markets stabilized by November, there were options available to stabilize payment settlement (nb3-1) and this part of the financial system (nb3-2) more quickly that were not implemented.

Additional “Unconventional” Operations by the Fed (or the Treasury) Are Necessarily About Interest Rates and Spreads, Not Quantities

The proposed TALF, announced by the Fed and the Treasury, is expected to purchase nearly \$1 trillion in securities backed by recent auto, home, student, and credit card loans. The purpose is to reignite lending in these sectors of the economy, where spreads above Treasury bonds remain at historical highs. Indeed, the success or failure of the TALF will be judged on how well it is able to reduce these spreads,

much as analysts have evaluated the TAF and related standing facilities. But since the creation of a loan in the first place requires a willing borrower at the current rate of interest, it is unclear if there will be too few or too many loans for the Fed to purchase relative to the arbitrary TALF limits; it is also unclear how much this will affect spreads that are indicators of whether or not markets are functioning “normally,” and how quickly these effects will occur. Mostly unmentioned, though, is the fact that if it is a particular spread or interest rate that is considered consistent with more “normal” functioning of credit markets, this could simply be set directly and immediately, allowing the quantity of loans purchased by the Fed to float. The spread could be set a bit above the historical or otherwise desired level, enabling financial institutions to purchase the loans at desired spreads once the financial system is willing and able to do so, which would then provide a clear signal that this moment had arrived. As an example, if it is deemed desirable to have conforming mortgages at four percent, which would put them near historical spreads over Treasuries (as of this writing in February 2009), then the Fed or the Treasury (which owns Fannie Mae and Freddie Mac) could purchase conforming mortgages at four percent. Overall, the use of values such as \$1 trillion in discussion of such “unconventional” operations assumes the Fed controls the money supply (NB1) and the quantity of private lending, when it does not. On the other hand, the Fed – as monopoly supplier of reserve balances – *can directly set a price* (i.e., an interest rate) at which it will purchase or sell an asset, and allow the quantity of loans purchased to float.

Concluding Remarks

This chapter has applied the SFM-A to the Fed’s operations, for which the core analytical framework is based upon the SFM (Hayden 2006, Chap.6) and evaluative criteria (Hayden 2006, Chap.5) derived from normative systems analysis (Hayden 1998). Together, these enable further extension into analysis of time and timeliness (Hayden 2006, Chap.8) in the Fed’s operations. The analysis results in a number of general principles for understanding the Fed’s operations. The overarching implication of this analysis is that the institutional design and context of the Fed’s operations are strongly influenced by an *instrumental-ceremonial dichotomy* (Bush 1987), where there are *instrumental* norms related to stabilization in the payments system and the financial system, but also *ceremonial* norms founded more or less on ideology and generally accepted but inapplicable theoretical models related to central bank control over the money supply, market efficiency, and concerns over the fiscal position of the federal government and subsidization of banks. Applications of this framework to events in the 1990s, early 2000s, and then to the recent financial crisis repeatedly suggests that the goal of stabilization should be the primary evaluative criteria for the design and articulation of the rules, regulations, and requirements related to the Fed’s operations, as the other criteria that have more ceremonial bases can be and have been inapplicable or – much worse – in conflict with achieving stability in the payments system and the financial system.

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