The FOMC's Use of Operational Targets: 85 Years and Counting

Jeffrey Huther, Elizabeth Klee, Kevin Kiernan, and Ethan Rodriguez-Shah

The FOMC's Use of Operational Targets: 85 Years and Counting

Jeffrey Huther[*] Elizabeth Klee[†] Kevin Kiernan[‡] Ethan Rodriguez-Shah[§]

May 14, 2023

Abstract

This paper uses summaries of the Federal Open Market Committee's (FOMC's) meetings to identify its operational targets and map those to operating regimes. We find that operational targets were more often discussed in the earlier part of the FOMC's 85-year history, but recent years have seen a resurgence in discussions. We identify distinct operating regimes and find that regimes with discussions of multiple targets, usually rate and quantity pairs, are more common than regimes dominated by discussions of single targets. We document that the current period (the 2007-2009 financial crisis to today) is a notable break in operational targets from earlier periods. We also show that shifts in operational targets occur during recoveries, or after a significant downturn in the macroeconomy.

1 Introduction

The consensus around the federal funds rate as an—and, for many years, the—operational target of the Federal Open Market Committee (FOMC) has been in place long enough that it is largely taken for granted. It has not always been so. The FOMC's operational target—the financial rate or quantity that the FOMC targets to achieve its ultimate economic objectives—has evolved over time and has included variables such as the level of reserves in the banking system, yields on Treasury securities, monetary aggregates, unsecured interbank lending rates, and, currently, a mix of market rates, administered rates and asset purchase targets.[1] Our goal is to provide a readily accessible perspective on the FOMC's use of these targets over time, to establish different operating regimes, or periods in which a particular operational target or targets were used, and to identify factors that influence shifts in operating regimes.

We characterize the FOMC's operational targets and regimes using techniques derived from the literature on natural language processing (NLP). We apply these techniques to the meeting minutes of 85 years of FOMC deliberations.[2] We have three main findings. First, we see discussions of operational targets peak following three events: the separation of monetary from fiscal policy with the advent of the Treasury-Fed Accord in 1951, the aggressive efforts to reduce inflation that began in late 1979, and the global financial crisis. Second, operational regimes identified in the historical literature are reflected in the relative frequency of associated operational target language. Our use of selected "bigrams"—two-word terms describing operational targets—line up with well-known periods and shifts of operational regimes, suggesting that analysis of word usage in FOMC documents can be helpful in identifying policy trends. And third, the FOMC often used more than one operational target simultaneously. We find that, quite often, quantity and rate targets were discussed simultaneously.

Members of the FOMC have long wrestled with the question of how operational targets should be used to achieve the Committee's economic objectives (for a few select examples of views over time, see Box 1). Prior to the introduction of verbatim transcripts in 1976, debates and uncertainty about appropriate operational tools and their usage can be gleaned from meeting minutes, ex-post reports and syntheses of other contemporary records. Garbade (2021), for example, uses a wide

---

[1]See Cap et al (2020) for a definition of operational targets and descriptions of how targets fit into monetary policy implementation frameworks. Our approach differs somewhat from Bindseil and Fotia (2021) who include monetary aggregates in their classification of ultimate, rather than operational, targets.

[2]Title II of the Banking Act of 1935 established the Federal Open Market Committee which first convened in March 1936. Our data set ends in 2021.

range of sources to describe the evolution of FOMC policies from 1951 – 1979. In this paper, we turn to the FOMC Minutes and similar summary documents to construct a continuous record of discussions on operational targets since the inauguration of the modern Committee structure in 1936. A thorough reading of these documents would be challenging given the number and length of the deliberation summaries, so we explore the use of contemporary computational techniques to identify underlying trends.

The large amount of information on the Committee's deliberations over time is both a blessing and a curse for researchers. Analyses of word usage reduce the direness of the curse by providing a relatively quick look at the language Committee members were using as they shaped policy, allowing for easy identification of turning points in policy discussions. We use this approach to complement broad descriptions of the use of operational targets (e.g. Bindseil 2014) in the academic literature on monetary policy implementation and the influence of academic work on policy discussions, notably the evolution of monetary aggregates following the publication of Friedman and Schwartz (1963). In some cases, our approach suggests the need for additional examination into broad-stroke characterizations of policy implementation.

2   Preliminaries

2.1   Natural language processing and the FOMC minutes

We construct a continuous set of documents by concatenating staff-authored summaries of the deliberations at FOMC meetings that have been approved by Committee members as official records.[3] Despite differences in naming conventions over time, the summaries are similar in content and structure to the modern FOMC Minutes. The resulting database runs from 1936 to 2021. It comprises 989 text documents, with an average of nearly 9,600 words per document.

Our approach applies techniques from the NLP literature.[4] We begin by removing common English stop words and proper nouns such as the names of FOMC participants.[5] From there, we construct word and phrase counts across all documents, focusing specifically on terms that describe

---

[3]We use Historical Minutes (March 1936 – May 1967), Memoranda of Discussion (June 1967 – March 16, 1976), Records of Policy Actions (March 29, 1976 – 1992) and Minutes (1993 – 2021). All documents are available at https://www.federalreserve.gov/monetarypolicy/fomc_historical_year.htm. The transition from Memoranda of Discussion and Records of Policy Actions to Minutes is discussed in Lindsey (2003). Also see Danker and Luecke (2005).

[4]The economic literature using natural language processing is expanding rapidly. Gentzkow et al (2019) provides an overview. Cieslak and Vissing-Jorgensen (2021) and others have applied these techniques to the FOMC minutes.

[5]See Bird, S., E. Klein, and E. Loper (2009). Natural Language Processing with Python: Analyzing Text with the Natural Language Toolkit. O'Reilly Media, Inc.

operational targets.

Our initial exploration of the word and phrase counts leads us to focus on two-word phrases ("bigrams") that describe operational targets. Individual words over-identify operational targets while trigrams and quadgrams appear overly restrictive. The most common word pairs include terms that we identified as policy implementation phrases while, for example, trigrams have low counts for common operational targets such as the funds rate and money supply.

After determining that bigrams best capture references to operational targets, we review the most frequent 5,000 bigrams for all variations on operational target word usage. The number of relevant bigrams in each document averages a little over one hundred. However, the number varies considerably, with a maximum of 448 in June 1973.[6] Out of the 5,000 terms in our sample, we identify 135 terms related to operational targets. These bigrams include contemporary terms (e.g. "funds rate"), terms relating to historical targets (e.g. "free reserves" and "monetary aggregates"), and terms that populate the complete list (e.g. "make purchases").

We group the operational target bigrams into categories of familiar operational approaches. We identify nine categories: four are quantity-focused, four are rate-based, and the last has elements of both. The quantity-focused targets are associated with Treasury, Federal Reserve, or bank liabilities. Reserve management includes discussions about the stock of reserves and its components. Measurement of reserves evolved with the Fed's understanding of bank reserves, commercial banks' capacity to efficiently allocate reserves, and other factors that affected the stock of reserves (autonomous factors and discount window usage). Asset management encompasses phrases related to both the duration and quantity of Treasury debt held as assets on the balance sheet of the Fed, including the bills preferably period that encompasses most of the 1950s (see Friedman and Schwartz 1963 and Garbade 2021). Money supply includes terms related to measures of the stock of money and to the broad description of supply ("monetary aggregates"). Finally, reserve requirements, while identified as a distinct category, combine conceptual elements of the reserve management and the money supply categories, and link bank reserves to the money supply.

The rate-focused targets are rates on Treasury or bank liabilities, determined by the market or administered by the Federal Reserve. The discount rate is the rate at which banks borrow directly from the Federal Reserve. Bill rates are relevant in the late 1950s and the 1960s when, under the

---

[6]In the earlier part of our sample, on some occasions separate Minutes were drafted for different parts of the meeting. This may in part explain the infrequent mention of our bigrams in some of the early documents.

Bretton Woods mechanism, differences in short-dated government rates created significant arbitrage opportunities. The federal funds rate is the rate at which banks and selected institutions borrow and lend reserve balances in the federal funds market. Yield curve control was an important component of Fed policy during and immediately after World War II.[7]

Finally, external account, as an operational target, was often discussed in the context of currency swaps but, also includes discussions of gold flows and, in some cases, movements of specific exchange rate pairs. These terms are especially common in discussions leading up to the dissolution of the Bretton Woods agreements as well as various foreign financial crises. The bigrams in each category are listed in table 2. For example, "M2 growth" and "monetary aggregates" are both included in the "Money Supply" category. Of note, there appears to be more heterogeneity for terms describing quantity targets than terms for rate target phrases. Part of this observation likely reflects long periods in which policy rates varied little, leading to little discussion of any operational targets. Similarly, we do not uncover a top 5,000 bigram associated with monetary policy easing, perhaps reflecting the timing asymmetry in which the Federal Reserve eases monetary policy—often quickly, as a result of a shock—versus tightens monetary policy—often well-telegraphed and gradually.

Another reason for the prominence of quantity terms may have been the relative difficulty of measuring and operating with quantity targets. For example, targeting the aggregate quantity of reserves was complicated by a disaggregated banking system that did not always reallocate reserves efficiently. Implementation of Committee directives required operations managers to estimate the reserves that would flow from generally reserve-rich smaller banks, located outside of the major markets, to larger, money center banks. In addition, targeting reserves required estimating discount window borrowing, as borrowing also increases reserves. Perhaps reflecting difficulties with quantity targeting, terms describing monetary aggregates also expanded as researchers sought to capture increasingly comprehensive measures.[8] In identifying relevant terms, we face two problems that apply to NLP generally, vagueness and ambiguity. To tackle vagueness, we excluded terms that did not clearly identify an operational tool or could be interpreted as unrelated to implementation of a specific tool. While the FOMC documents have been written, and

---

[7]These regimes do not include references to the Fed's "even keel" policy in the 1950s and 1960s in which the Fed avoided changing its operating stance during Treasury financing operations. While this policy influenced the use of operational targets, we did not view it as a stand-alone target.

[8]Atkinson (1969) writes that "The term 'feel of the market' (FOTM) is perhaps the most commonly used phrase for describing a condition of markets" suggesting an era without operational targets. His views may have overweighted the time in which he was writing – "tone" and "feel" terms are not words that appear as a component of any of the top 3,000 bigrams.

heavily reviewed, to avoid unintentional vagueness, the authors and, sometimes FOMC members themselves, have intentionally avoided precise use of terms that over or under state policy. To tackle ambiguity, we did not include terms such as "interest rates" because they have been used in many contexts – interest rates, for example, may be shorthand for financial conditions or market interpretation of the Committee's future policy actions as well as a reference to the Committee's operational targets.

2.2 Operational targets over time

Figure 1 displays the raw counts of our identified operational target bigrams over time. The number of bigrams trends upward, from a low of less than 100 counts per meeting in the FOMC's early years, to a peak of over 400 counts in the mid-1970s. There is pronounced volatility as well, with a notable drop off in the mid-1970s. This drop off likely reflects in part the release of the FOMC meeting transcripts to the public, an event that was associated with a reduction in the length of the Minutes documents as well as the frequency of publication. After a quieter period through the mid-2000s, there was a subsequent rise during and following the financial crisis of 2007-2009. The seasonality apparent from the mid-1990s to the present reflects organizational matters reviewed at the beginning of the year; those summaries are included in the minutes from the January meetings.
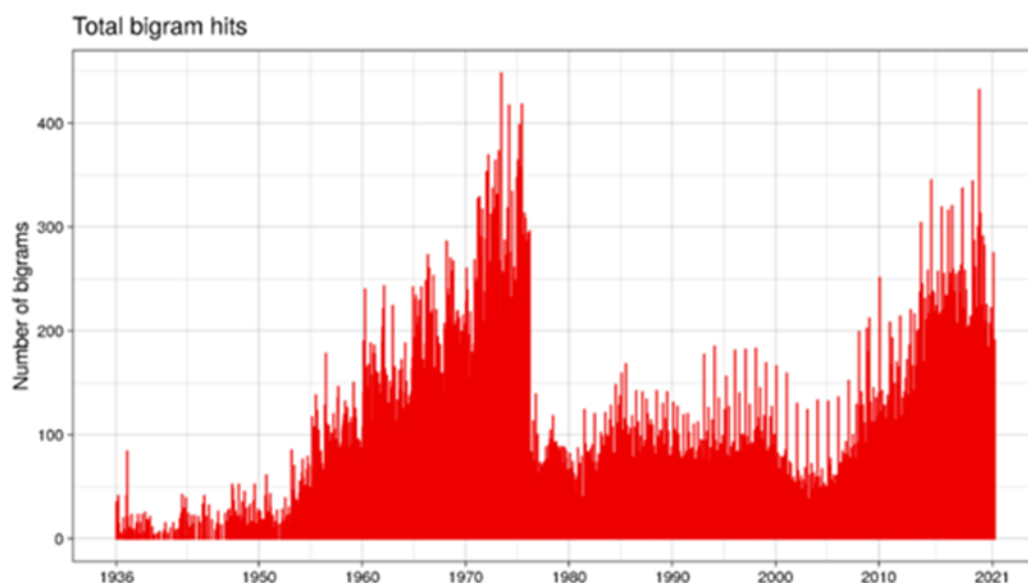

Figure 1: Total operational target bigrams per meeting

While the number of bigrams is instructive, the length of the FOMC documents has changed

over time. The word count in the historical records grew slowly through the 1960s, peaked in the 1970s, gradually declined up to the financial crisis, and then rose to present. The pattern reflects factors including meeting frequency, for which the pace has generally slowed, pressures for increased transparency (notably in the late 1960s and early 1970s), and the introduction of transcripts (which may have changed the writers' perspective on the role of their documentation) as well as the intensity of discussion on operational targets. The irregular word counts and relevant bigrams led us to use bigrams as a share of total words in a document (excluding stop words), displayed in figure 2. Over time, the share of words in a document that appear in our dictionary of bigrams ranges from less than 2 percent to over 6 percent.

The use of relative, rather than absolute, intensity of operational target bigrams gives us a better picture of trends in operational targets over time. In particular, figure 2 shows a rise in relevant terms following the accord with Treasury in 1951, the increasing discussions of operational tools in the 1970s as efforts to work with monetary aggregate targets proved difficult to implement, the growing comfort with policy tools in the 1980s as the FOMC slowly coalesced around the federal funds rate as the sole operational target, the auto-pilot approach to rate increases in the mid-2000s, and the increasing discussion of policy tools following the financial crisis actions beginning in 2008.
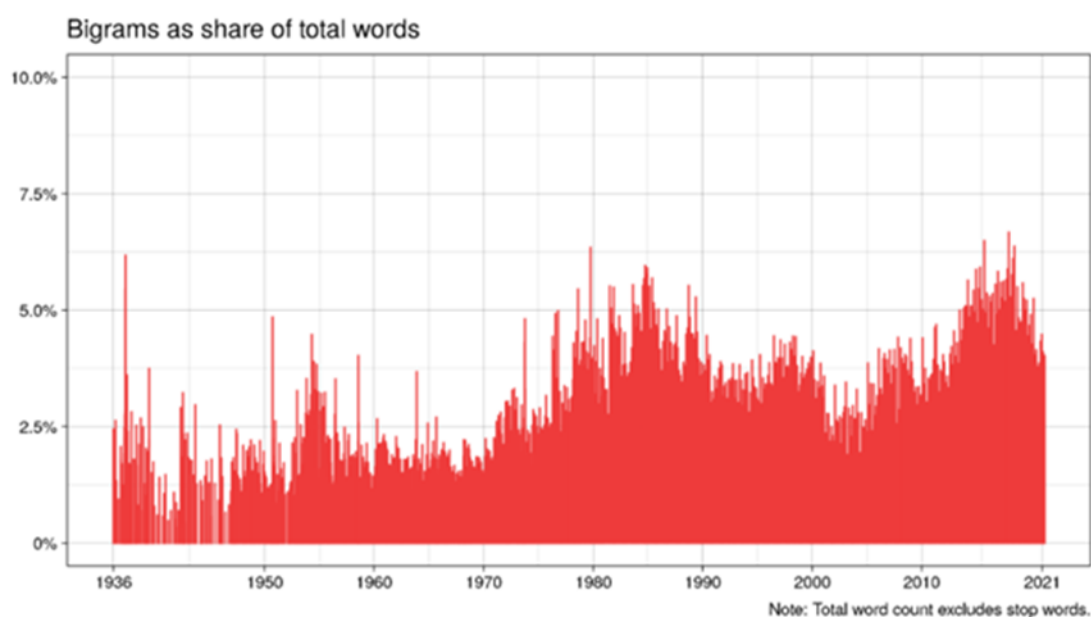

Figure 2: Bigrams as a share of total words

In line with our conclusion that relative frequencies are a better indicator of policy delibera-

tions than absolute frequencies, we use a standard technique in the NLP literature to to weight the appearance of a bigram in a particular instance of the Minutes relative to overall bigram counts. More precisely, we use a term-frequency-inverse document frequency (TF-IDF) measure. It is calculated as the product of two expressions. The first expression is the term frequency $TF(b, m)$, or the relative frequency of bigram b in Minutes m:

$$TF(b, m) = \frac{f_{b,m}}{\sum_{b' \in m} f_{b',m}}. \tag{1}$$

The second expression is the inverse document frequency, or the inverse of the log of the fraction of total Minutes (M) that contain the bigram b:

$$IDF(b, m) = log \frac{M}{\{m \in M : b \in m\}}. \tag{2}$$

Note that if the bigram is not in a particular Minutes, $TF(b, m) = 0$, or if the bigram is in all the Minutes, $IDF(b, m) = 0$. In what follows, our NLP analytics rely on this measure. However, our conclusions are robust to other techniques.

2.3 Rate and quantity pairs

With our TF-IDF measures in hand, we can provide evidence for one of the key findings of this paper, which is that the Committee often used more than one operational target simultaneously, and more specifically, we find that the Committee often discussed operational targets in rate-quantity pairs. We examine the dynamics of three of these pairs and show that the pairs can be substitutes, complements or both over time.

We start with reserve management and the discount window borrowing rate. As shown in figure 3, reserve management and discount rate terms were among the most widely used operational targets from the early 1950s to around 1970. Despite high coincidence of these terms, usage was occasionally negatively correlated, suggesting that the Committee viewed the tools as substitutes rather than complements at times. Of course, these terms are also negatively correlated in concept, as the price of borrowing reserves in this time period was the discount rate, and if the price went up, the quantity should go down. The main point is that neither policy tool should be considered in isolation given the high frequency of paired usage.

8

Operational Targets TF-IDF Rank
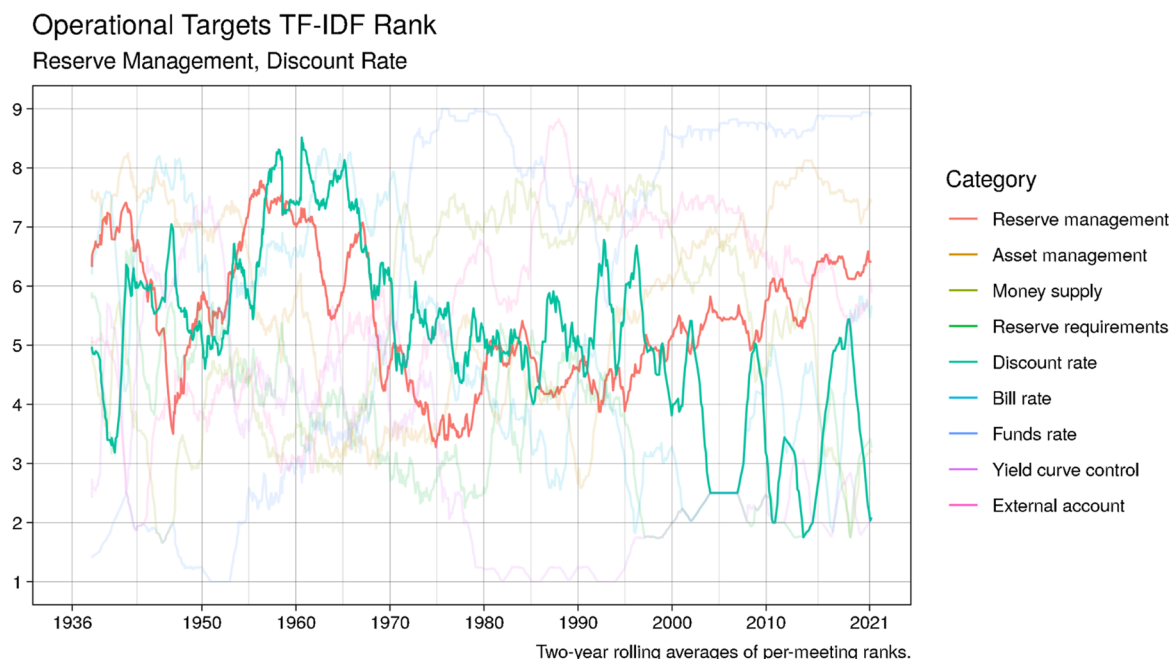Reserve Management, Discount Rate

Figure 3: TF-IDFs for reserve management and the discount rate

For the next example, we pair Treasury bill rates and the external account. The Bretton Woods system created potential arbitrage opportunities between short dated sovereign debt instruments. In the immediate aftermath of World War II, financial market participants could not take meaningful advantage of interest rate differentials given the war-orientation of financial For the next example, we pair Treasury bill rates and the external account. The Bretton Woods system created potential arbitrage opportunities between short dated sovereign debt instruments. In the immediate aftermath of World War II, financial market participants could not take meaningful advantage of interest rate differentials given the war-orientation of financial institutions but, by the late 1950s, gold outflows needed to facilitate the arbitrage had grown enough to warrant Committee discussion. Specifically, potential arbitrage profits rose sharply in early 1958 as Treasury bill rates declined from 2.75 percent at the end of December 1957 to 1.55 percent at the end of January 1958. Of note, Friedman and Schwartz (1963) identify February 1958 as the beginning of gold outflows with sterilization through open market operations beginning in March 1958.

Figure 4 shows a strong positive correlation and complementarity in the Committee's use of terms related to Treasury bills and foreign exchange in the 1960s. The correlation broke down following the last sputterings of Bretton Woods in 1973. Committee discussion of Treasury bills dropped off but the use of external account terms grew, peaking with Japan's asset price bubble

9

in the late 1980s. The discussion of both terms picked up in the years including and following the 2007-2009 financial crisis, reflecting in part the use of asset purchases over this period and the global impact of the crisis.
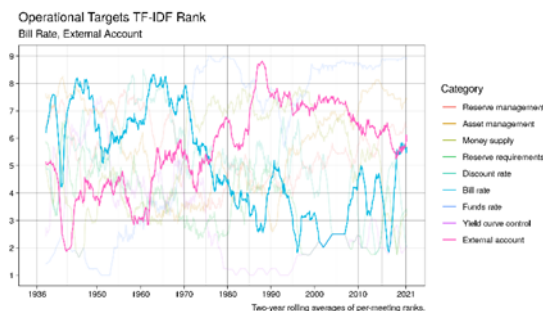
Figure 4: TF-IDFs for bill rates and the external account

Our final example focuses on the federal funds rate and monetary aggregates. As displayed in figure 5, while money supply terms appeared in the early years of the Committee, the use of money supply and fed funds together was low until the late 1960s when mentions of money supply and the fed funds rate rose simultaneously. Both regimes rose in the late 1960s as the Bretton Woods constraints broke down and the Fed developed and monitored monetary aggregates. Our metrics show a complementary relationship between the federal funds rate and monetary aggregates that persisted into the mid-1990s, although the use of fed funds terms was somewhat more volatile than money supply terms over this period. The counts of monetary aggregate terms persisted well after the federal funds rate became the primary indicator of the FOMC's contemporary stance on monetary policy: only in the 2000s did the use of monetary aggregates fall notably in prominence. Since 2000, the fed funds rate has unambiguously dominated the Committee's discussions of operational tools.

Figure 5: TF-IDFs for the funds rate and the money supply

Why were there so many operational targets in use at any point in time? One conjecture is that there may be potential weaknesses in relying on a single policy instrument. Bindseil (2014) suggests that the use of various quantity targets (he identifies seven between 1920 and 1983) absolved the Fed from r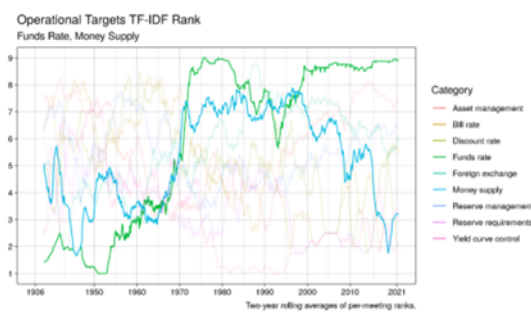esponsibility for short-term interest rates. A staff briefing to the FOMC in 1995 reviewed the use of rate targets and pointed to a weakness in fed funds targeting.[9] It noted that discrete, transparent changes in the fed funds target could be a source of inertia in the FOMC's policy stance because these discrete, transparent changes would require a high burden of proof of changes in economic activity. In contrast, continuous, opaque targets such as monetary aggregates had allowed for small changes in policy stance. An underlying point of the discussion was that the FOMC operates in an environment that is inherently uncertain and that reducing decisions to discrete rate targets forces FOMCs to provide unrealistically certain views of the direction of the economy.

As is evident from these three pairs, until the fed funds rate came to dominate operational target discussions in the 1990s, the FOMC generally discussed targets in terms of rates and quantities. The move to a single, rate-based target may have been based on the lack of a strong correlation between monetary aggregates and economic activity, perhaps in part because of the growth of intermediation outside of the banking sector. The rise in discussions of quantity-based targets following the financial crisis was largely a consequence of interest rates falling to the effective lower bound rather an effort by the FOMC to simultaneously manage rates and quantities. The post-crisis management of quantities has largely been discussed in terms of the Fed's assets in contrast to the earlier focus on liabilities. This change in quantity focus from liabilities to assets may reflect the evolving nature of financial markets – Fed liabilities are concentrated on the balance sheets of banks and a small group of repo market counterparties while assets held by the Federal Reserve may be the same as those on any intermediary balance sheet.

3   Regimes

In this section, we discuss FOMC operating regimes. We use the term "regime" to highlight the dominance of a specific category or categories of operational targets that are the focus of the FOMC. We first identify regimes using NLP techniques, focusing on ranking TF-IDFs, cluster analysis, and distance calculations. We then compare these regimes to historical accounts.

---

[9]Appendix to the March 1995 FOMC meeting which, in the concluding paragraph, asserts that "the appropriate level of interest rates is impossible to pinpoint…"

3.1 Identifying regimes using NLP

We take three approaches to identifying regimes. We discuss each in turn.

3.1.1 Ranking bigrams

For our first analysis, we identify regimes by ranking bigrams. We perform this analysis in five steps. First, we divide our corpus by year. Second, we calculate each bigram's TF-IDF measure using the documents from that year. Third, we rank the TF-IDFs from highest to lowest. Fourth, we map bigrams to their categories. And finally, we define regimes as periods when the same category is ranked first or second for at least two years in a row.

Our definitions lead to the regime identification displayed in figure 6.[10]
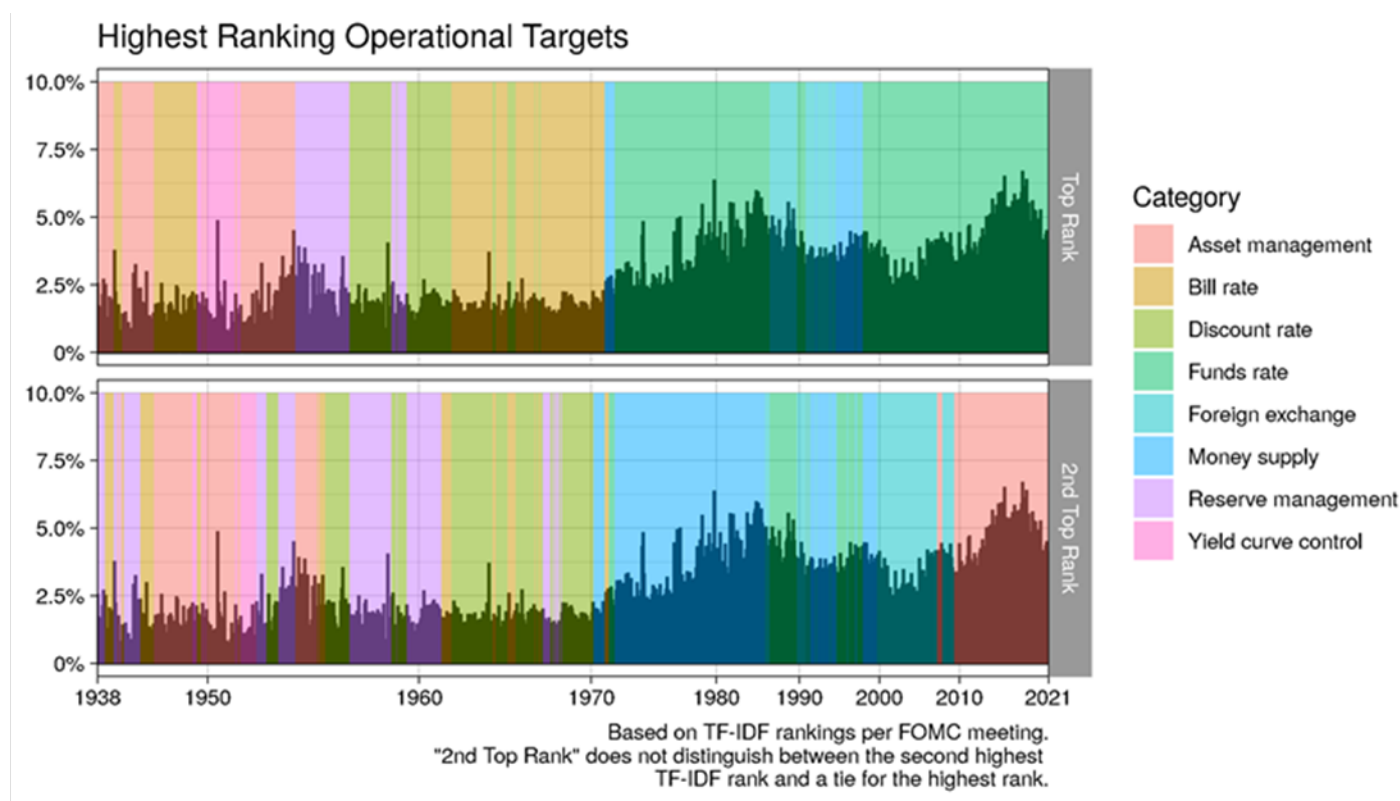

Figure 6: Operating regimes—TF-IDF ranking

Broadly speaking, operational target regimes changed more frequently before 1960 than after-

---

[10]A comprehensive look at the FOMC's operational target history as well as that of other central banks is available in Bindseil (2014).

wards. Some of the early variability can be attributed to the difficulties that the Committee faced in dealing with the Great Depression and WWII financing, but it is also likely to reflect a natural learning process for a committee in its pre-adolescent years. Later stability may also be attributable to more reliance on theoretical approaches for policy implementation. The Committee's early adoption of "bills preferably" for the asset side of the Fed balance sheet still left the Committee with questions of implementation. When the Bretton Woods agreement became a binding constraint in the late 1950s and early 1960s, necessity may have provided operational clarity that had previously been absent. The development of monetarist economics in the late 1960s focused implementation discussions even though the relationship between monetary aggregates and economic activity ultimately turned out to be unstable. From the 1970s and 1980s to the present, the push for greater transparency of the FOMC may have strengthened the need for consistent, readily identifiable operational targets.

3.1.2   Cluster analysis

For our second analysis, we rely on clustering techniques. We perform the clustering analysis on the same meeting-frequency TF-IDF vectors for each of our nine categories that we used for our ranking procedure. We then use the k-means algorithm to partition meetings into k groups to minimize the variance in each group. We choose the number of groups heuristically based on a marginal improvement in the minimization. For our vectors, we find six groups perform well.

Results from the clustering analysis are displayed in figure 7. Our chart uses the first two principal components of our nine categories of bigrams as the axes. A cautionary note about this diagram is that these principal components explain less than half the variation in the bigrams over time. As a rough generalization, a positively sloped vector is closed associated with bills preferably, T-bill rate targeting and fed funds regimes while a negatively sloped vector is associated with the monetary aggregates and asset purchase regimes. In terms of timing within our 85 year sample, the sequence is red, blue, aqua, purple, green, and finally, yellow.

On these dimensions, one could also surmise that there are primarily three clusters: Pre-M2, M2, and now. But because the figure presents information only for the first two principal components, we posit that there may be important variation captured by adding more clusters.
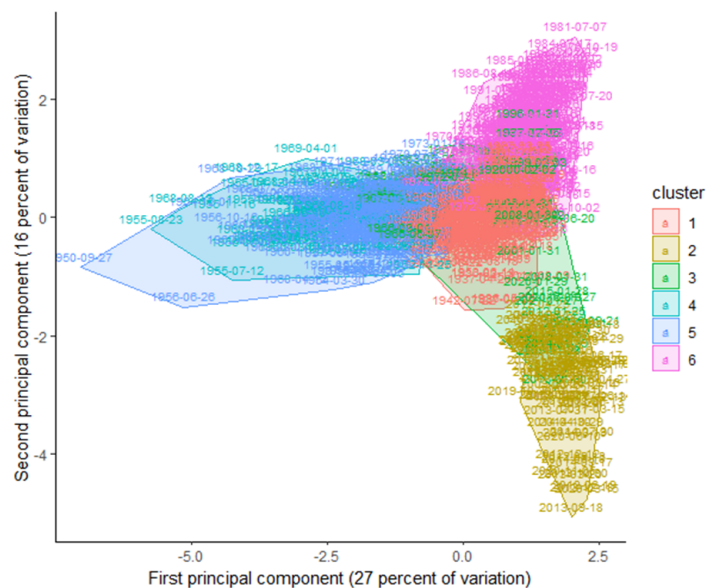
Figure 7: Clustering analysis

3.1.3 Distance analysis

Our final NLP exercise for identifying regimes relies on distance metrics at a meeting frequency. Both the x-axis and y-axis of figure 8 plot 989 meeting dates; we label only the year for clarity. The shading indicates the Euclidean distance between the vector of TF-IDFs for different meeting dates. Light shading indicates shorter distances; dark longer ones. As we would expect, distances along the 45 degree line are lightest, as the distance of a meeting from itself is zero.

We highlight three takeaways from this exercise. First, the distances between time-proximate meetings earlier in our sample tend to be greater. For example, before 1970, there is a higher incidence of darker shading closer to the 45 degree line. This first observation leads us to our second one: there is a clear period of calm from about 1980 through the 2007-2009 financial crisis. Interestingly, this period corresponds to the "Great Moderation" for the macroeconomy, consistent with the idea that regime shifts do not occur during calm periods. Looking at this region around the 45 degree line in the second half of the period, the distances between observations are relatively small.

And third, our time is different. The dark shading that starts around 2012 indicates that today's regime is different from those that came before. This period started with the European crisis and when quantitative easing became largely focused on providing monetary policy accommodation,

14

in contrast to targeting market functioning or crisis management goals. Importantly, we see that the area around the 45 degree line still has lighter shading. Still, there is a clear break between the current period and earlier in the 2000s.
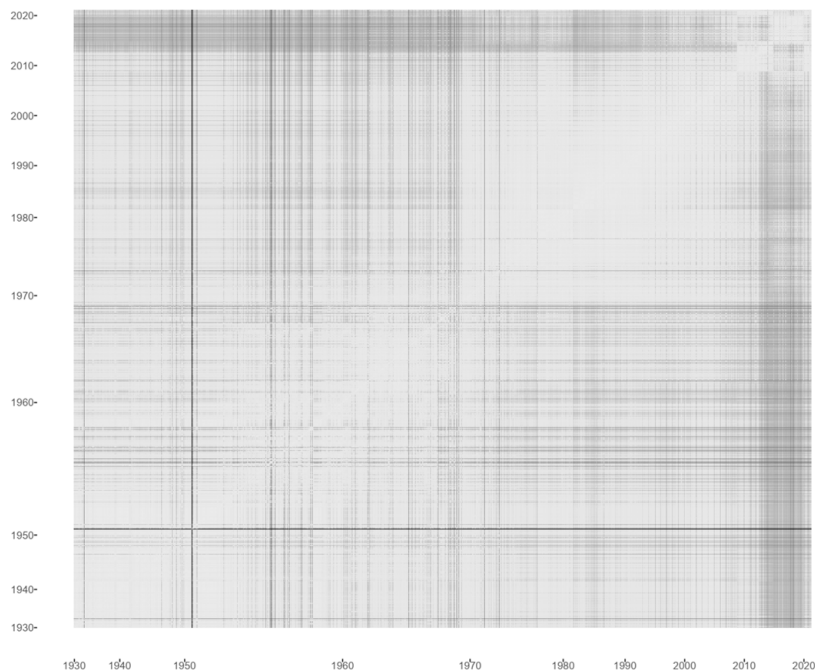
Figure 8: Meeting distance metrics

3.2 Identifying regimes using historical analysis

Our identifications align well with narrative histories of the FOMC. We use several well-known historical sources for regimes and overlay the broad agreement on operational regimes over our identified bigrams in figure 9.

We found that Garbade (2021), in particular, provides a thorough assessment of operational tool usage from 1951-1979; our regimes match his to a large extent. Bindseil (2014) uses secondary sources to construct a chronology of policy regimes prior to targeting fed funds: 1931-1952 (excess, but restrictive, reserves), 1952-1970 (free reserves targeting), 1970-1974 (reserves on private deposits), 1974-1979 (implicit fed funds targeting), and 1979-1982 (non-borrowed reserve targeting). Friedman and Schwartz (1963), writing before clear periods of several of these regimes developed, review FOMC word usage in terms of policy stance rather than implementation (with the exception of noting the Committee's use of forward guidance, referred to as an "open-mouth"

15
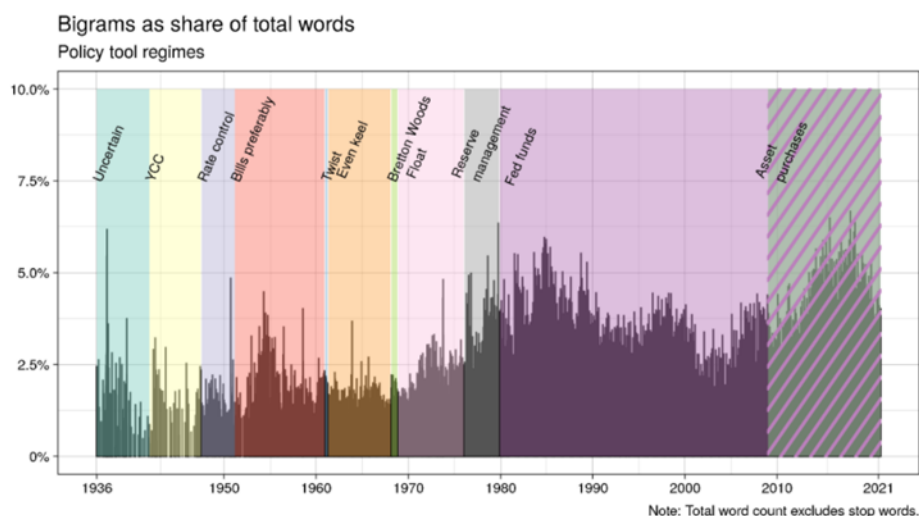
Figure 9: Historical regimes identification

policy).[11] A common theme of these authors is that stated Committee goals (e.g. bills preferably, monetary targets, various forms of reserve management) occasionally conflicted with political or economic needs.

According to both our bigrams and historical investigation, yield curve control captured the FOMC's attention in the 1950s and 1960s, in the wake of the Treasury accord. This morphed into the "bills preferably" period in the 1960s. The monetary aggregates regime was evident in the 1970s, and some importance to this regime lasted through the 1990s. Federal funds targeting arguably runs from the early 1980s (or, possibly, the early 1970s depending on author) to the 2007-2009 financial crisis. For example, Bindseil (2014) describes the second half of the 1970s as a period of implicit fed funds targeting with the fed funds as the sole target beginning in 1994. His delineation is based primarily on Cook and Hahn (1989), who demonstrated that there appeared to be a relatively transparent view of what rate the Desk was targeting over this period.[12]

Even with this concordance of computer processing and historians, clear-cut regimes may be more apparent than real. For example, characterizations of operational targets by Committee members, highlighted by the quotes in the box "Thoughts on operational targets over time", suggest that the adoption of fed funds targeting followed experimentation with alternative targets that extended well into the 1990s. In addition, a generic observation of our regime-based approach is that regime volatility is higher when regimes are not widely discussed. For the low-count regimes, a single

---

[11]Meltzer (2009) offers a modern perspective on early Committee decision-making.

[12]Also see Anbil et al (2020) for a longer time series of the federal funds rate.

mention can shift the relative relationships. We see this volatility, for example, with fed funds and money supply terms in the early years of the FOMC and tools that have generally been used to support other tools for policy implementation, such as reserve requirements.

Thoughts on Operational Targets Over Time

``In so concentrating operational attention upon day-to-day market rates rather than on the 3-month bill rate, I recognize I am suggesting a departure of sorts.'' Robert Holland (staff member for the Board of Governors, later Federal Reserve Board governor), January 12, 1965. Historical Minutes.

Governor Partee: ``The question is, can we do better with the federal funds rate or with some kind of reserve [aggregate]? I think the answer was that there is not much difference.'' March 29, 1976. Transcript.

Governor Baughman: ``Well, it simply implies, does it not, that total reserves is our overriding target?'' January 8-9, 1980. Transcript.

President McTeer: ``I think it's dangerous for our future to have the political spectrum from Milton Friedman on the one hand to Paul Samuelson on the other bashing us for tight money based entirely on M2'' February 2-3, 1993. Transcript.

---

4   Quantitative assessments

As our final set of investigations, we apply typical economometric techniques to answer two questions. First, what operational targets are most often associated with shifts in the target regime? And second, what are the macroeconomic conditions surrounding these regime shifts. We answer each in turn.

4.1   Preliminaries

To motivate our analysis, figure 10 displays how the regimes shift over time. We define a regime shift as a period in which the cluster changes, where the clusters are defined as in figure 7. We concentrate on the period from 1960 to present, thereby eliminated the somewhat noisier pre-Accord period. "Yes" indicates a change in regime, and "no" does not.

The information in figure 10 largely agrees with that in 8. The periods of consensus, illustrated by a lack of regime change in the chart above, include the monetary aggregates regime in the 1970s,

the fed funds regime (punctuated by routine changes in the early 2000s) and an "autopilot" period in the late 2010s.
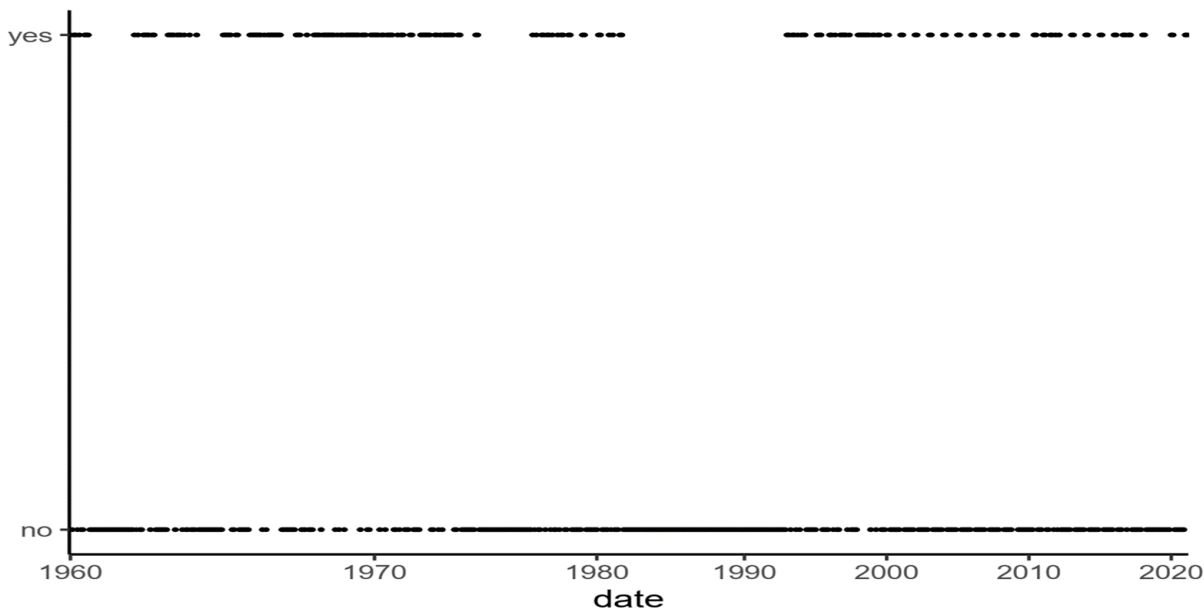
Figure 10: Regime shifts over time

What are the operational targets most frequently associated with these shifts? To investigate this question more closely, we evaluate a model of the form:

$$\Pr(S_t = 1) = f(X_{it}; \epsilon_t) \tag{3}$$

where S_t is an indicator of a shift in regime, and equals 1 with a regime shift, X_{it} is the TF-IDF for operational target i at time t, and ϵ_t is a normally distributed error term. We evaluate a probit model with robust standard errors to control for potential heteroskedasticity or serial correlation.

Table 3 displays the results. The first column explores quantity targets only. We see little statistical difference in many of the categories for suggesting a regime change, save a negative correlation for money supply. We believe that this is associated with the period of the Great Moderation, when operational targets did not shift. As discussed above, federal funds rate and money supply terms were paired for much of this period.

The second column reviews results for rates only. Here we see that discount rate targeting is associated with relatively frequent regime shifts, while federal funds rate targeting is associated with relatively infrequent ones. Discount rate targeting was more prevalent before the Great Mod-

18

eration, and as discussed above, was associated with the gold standard and general operational target shifts. The negative coefficient on the funds rate coefficient likely reflects the same factors as that for the money supply.

The third and fourth columns bring in the external account, as well as tests all factors simultaneously. As discussed above, discussions of the external account usually occur during tumultuous times; the positive and economically meaningful coefficient is consistent with historical context. In the last column, our previous results for the subcategories hold, save the statistical significance of the federal funds rate. Given that movements in the importance of the funds rate are likely similar to that of the money supply, the fall in significance of the funds rate and the attenuation of the coefficient on the money supply sharpens our previous conclusions of multiple targets and relative operational calm during the Great Moderation. As suggested by the figure, operational We examine the relationship between the Committee's discussions of specific operational targets and the economic conditions it has confronted over time. with a look at the relationship between economic variables in changes in the previously identified operating regimes:

Our final exercise explores the association between operational regime changes and the macroeconomy. We re-evaluate a probit model exploring the factors that explain regime changes, with the functional form:

$$\Pr(S_t = 1) = f(Y_{it}; \epsilon_t) \tag{4}$$

where Y_{it} is the four-quarter change in the relevant macroeconomic indicator. We investigate three: the unemployment rate, the PCE price index, and GDP growth. Again, we incorporate standard errors that are robust to heteroskedasticity or serial correlation of unknown form.

Our results are displayed in table 4. Looking at each macroeconomic factor individually in columns (1) through (3), contemporaneous declines in the unemployment rate and inflation, and increases in GDP growth, are associated with regime changes. The coefficients are consistent with the observation that regime changes seem to occur during improving economic conditions; that is, it is more likely to see a regime change when the unemployment rate is declining, inflation is going down or GDP is improving. Putting these results together in column (4) preserves their robustness, with only small changes in economic and statistical significance.

What about real conditions a year or two prior? We present analysis of this question in columns (5) through (8). Overall, conditions tend to be relatively strong in the rear view mirror as well.

19

Interestingly, the economic significance of the unemployment rate declines, but that of inflation and output pick up somewhat. As output tends to be more volatile than the unemployment rate, it may be that, historically, the Committee waited until the labor market recovered to make significant changes to its operational framework.

5   Concluding remarks

Word counts and NLP are clearly not a substitute for a thoughtful examination of the FOMC's historical record and are no substitute for the careful work of, for example, Friedman and Schwartz (1963), Meltzer (2004), and Garbade (2021). Nonetheless, NLP can complement existing work by identifying trends that would otherwise require extensive historical research to establish. The historical term usage patterns coincide with the broad evolution of the FOMC's focal points of discussion and in this regard are good indicators of operational targets. The phrases found in the minutes are also supported by quotes from transcripts, some of which have been displayed above. Those quotes are indicative of the uncertainty policymakers have had when using operational tools to implement policy objectives. The transparency of FOMC intent may have contributed to a shift in the audience for operational targets. Specifically, the material in the Minutes and from other FOMC documents suggests that operational targets have evolved from guidance to staff for the implementation of monetary policy to guidance to market participants. This shift may have contributed to the use of the fed funds rate as the single operational target and helps to explain why changes in the target rate have, in recent decades, have led to coincident changes in market rates without changes in Fed market activity. Transparent operational targets, however, were originally viewed as having drawbacks. Arguments that have been considered for not having publicly announced targets at all include the potential inappropriateness of given targets when conditions change rapidly and, less compelling, that once published, it is very hard to stop publishing (e.g. Kohn 1995).[13]

We are fortunate to be able to draw on the work of those doing extensive historical research on FOMC operational tools. The work of others gives us some confidence that our NLP identification strategy is a reasonable representation of FOMC deliberations. It suggests that our approach may

---

[13]Also in the 1995 memo, Kohn points out that there may have been a separation between discussions of specific targets and policy implementation: "I think we sometimes exaggerate the role the aggregates used to play in policy. After 1982 these variables did not trigger automatic changes in the stance of the System in reserve markets—and they were frequently allowed to run outside target bands for a good while. But movements in the aggregates were considered in a significant way in policymaking, and when they and other indicators were tending to run in the same direction, money supply developments may have prompted quicker and more forceful action."

be helpful for those considering other questions related to the history of the FOMC and the Federal Reserve more generally. Examples could include shifts of focus on specific industrial sectors, the role of bank credit in the economy, international influences on domestic monetary policy, and the effects of academic research and shifts in intellectual paradigms on changes in Federal Reserve policy.

References

Anbil, Sriya, Mark Carlson, Christopher Hanes, and David C. Wheelock (2020). "A New Daily Federal Funds Rate Series and History of the Federal Funds Market, 1928-1954," Finance and Economics Discussion Series 2020-059. Board of Governors of the Federal Reserve System (U.S.).

Atkinson, Thomas (1969). "Tone and Feel of the Market as a Guide for
Federal Open Market Operations" in Targets and Indicators of Monetary Policy, ed. by Karl Brunner. Chandler Publishing.

Axilrod, S. H., Lindsey, D. E. (1981). Federal Reserve System Implementation of Monetary Policy: Analytical Foundations of the New Approach. The American Economic Review, 71(2), 246–252.

Bindseil, Ulrich (2014). Monetary Policy Operations and the Financial System. Oxford University Press.

Bindseil, Ulrich and Alessio Fotia (2021). Introduction to Central Banking. Springer Publishing. https://link.springer.com/content/ pdf/10.1007%2F978-3-030-70884-9.pdf.

Cap, Adam, Mathias Drehmann, and Andreas Schrimpf (2020). "Changes in Monetary Policy Operating Procedures over the Last Decade: Insights from a New Database," BIS Quarterly Review, December, 27-39.

Cieslak, Anna, and Annette Vissing-Jorgensen (2021). The Economics of the Fed Put, The Review of Financial Studies, 34(9), 4045–4089.

Cook, Timothy and Thomas Hahn (1989). "The Effect of Changes in the Federal Funds Rate Target on Market Interest Rates in the 1970s," Journal of Monetary Economics, 24, 331-351.

Feinman, Joshua (1993). "Reserve Requirements: History, Current Practice, and Potential Reform," Federal Reserve Bulletin, June.

Friedman, Milton and Anna J. Schwartz (1963). "A Monetary History of the United States, 1867–1960," NBER Books, National Bureau of Economic Research, Inc, December.

Garbade, Kenneth D. (2021). After the Accord, A History of Federal Reserve Open Market Operations, the US Government Securities Market, and Treasury Debt Management from 1951 to 1979. Cambridge University Press.

Gentzkow, Matthew, Bryan Kelly, and Matt Taddy (2019). "Text as Data," Journal of Economic Literature, 57 (3): 535-74.

Kohn, Don (1995). Memo to the FOMC, March.
https://www.federalreserve.gov/monetarypolicy/fomchistorical1995.htm.

Lindsey, David (2003). A Modern History of FOMC Communication: 1975-2002.
https://www.federalreserve.gov/monetarypolicy/files/FOMC20030624memo01.pdf

Lindsey, David, Athanasios Orphanides and Robert Rasche (2005). The Reform of October 1979: How It Happened and Why. Federal Reserve Board 2005-112.

Meltzer, Allan (2009). A History of the Federal Reserve, vol. II. The University of Chicago Press.

Table 1: Sources

	Start date	**End date** (inclusive)
Included in analysis		
Historical Minutes	March 1936	May 1967
Memoranda of Discussion	June 1967	March 1976
Record of Policy Actions	March 1976	January 1993
Modern Minutes	February 1993	Present
Excluded from analysis		
Record of Policy Actions	March 1936	December 1992
Minutes of Actions	June 1967	December 1992
Transcripts	March 1976	December 2016
Statement	February 1994	Present

Table 2: Operational target bigrams

	Quantities				Domestic Rates				External Account
Reserve Management	Asset Management	Money Supply	Reserve Requirements	Discount Rate and Bankers Acceptances	Treasury Bills	Federal funds rate	Yield Curve Control		External Account
absorbing reserves	agency debt	aggregates appeared	increase requirements	discount rate	bill auction	funds rate	bills certificates		cy arrangements
additional reserves	agency issues	aggregates money	reduction requirements	change discount	bill holdings	funds traded	certificates amounts		cy operations
agreements repurchase	agency mbs	behavior m1	required reserves	increase discount	bill rate	raise target	term rate		exchange markets
bank reserves	agency mortgage	broader aggregates		bankers acceptances	bill rates	range funds			exchange rates
borrowed reserves	asset purchase	defined money		discount rates	bills held	rate funds			foreign currency
enter repurchase	asset purchases	demand money		reduction discount	bills purchased	target funds			gold certificates
excess reserves	backed securities	discount window		rate discount	month bill	target range			gold outflow
free reserves	balance sheet	ease money		bank discount	purchases bills				gold pool
free target	government securities	easy money			securities bills				gold price
growth reserves	holdings agency	expansion m2			three month				gold sales
increase reserves	holdings treasury	expansion money			treasury bills				gold stock
level free	make purchases	firming money							million gold
matched sale	maturing bills	growth aggregates							operations foreign
maturing securities	maturing issues	growth m1							price gold
net borrowed	mortgage backed	growth m2							swap arrangements
net free	outright purchases	growth m3							swap drawings
nonborrowed reserves	pace asset	growth monetary							swap line
private deposits	pace purchases	growth money							swap transactions
provide reserves	purchase program	m1 growth							
	purchase sell	m1 m2							
repurchase agreements	purchases coupon	m1 percent							
repurchase operations	purchases longer	m2 growth							
reserves available	purchases sales	m2 m3							
reserves banking	purchases securities	m2 percent							
reserves needed	purchases treasury	m3 annual							
reserves open	reinvesting principal	m3 coming							
reserves provided	securities agency	m3 percent							
reserves supplied	securities held	m3 period							
reverse repurchase	securities holdings	measures money							
supply reserves	securities maturing	monetary aggregates							
supplying reserves	securities open	monetary base							
total reserves	securities pace	monetary expansion							
	securities sold	monetary growth							
	security holdings	monetary restraint							
	sell securities	money growth							
	selling securities	money stock							
	treasury securities	money supply							
		range m1							
		range m3							
		rate m1							
		rates aggregates							
		reserves money							
		tight money							
		year m2							

Table 3: Regime changes and operational targets

	Quantities	Rates	External account	All
Reserve management	0.011			0.004
	(0.026)			(0.034)
Asset management	-0.020			0.009
	(0.017)			(0.019)
Money supply	-0.086***			-0.065**
	(0.021)			(0.023)
Reserve requirements	0.050			-0.006
	(0.038)			(0.041)
Discount rate		0.087**		0.088*
		(0.030)		(0.034)
Bill rate		-0.017		-0.042
		(0.025)		(0.029)
Federal funds rate		-0.041*		-0.037
		(0.020)		(0.023)
Yield curve control		0.041		0.037
		(0.025)		(0.028)
External account			0.177***	0.161***
			(0.017)	(0.017)
Number of observations	629	629	629	629
AIC	783.6	782.4	710.7	695.4
BIC	805.9	804.6	719.6	739.8
Log.Lik.	-386.818	-386.180	-353.337	-337.699
Pseudo-R^2	0.039	0.045	0.149	0.195

Significant at: +10 percent level; *5 percent level; **1 percent level.

Notes: This table provides from a probit model to explore determinants of changes in the operational target regime. The dependent variable equals 1 if there is a cluster change, with the clusters illustrated in figure 7. An observation is a document included in the analysis and as described in table 1. Parameter estimates are marginal effects of a change in the TF-IDF measure. Robust standard errors are in parentheses.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 4: Regime changes and real variables

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Dependent variable: Equals 1 if regime change							
Contemporaneous factors								
Unemployment rate	-0.083***			-0.069***				
	(0.013)			(0.015)				
Inflation		-0.020*		-0.026*				
		(0.009)		(0.013)				
GDP growth			0.015*	0.021*				
			(0.006)	(0.008)				
Lagged factors								
Unemployment rate								
Lagged one year					-0.073**			-0.006
					(0.025)			(0.036)
Lagged two years					0.011			-0.055+
					(0.024)			(0.031)
PCE								
Lagged one year						-0.009		-0.066*
						(0.020)		(0.027)
Lagged two years						-0.018		0.031
						(0.019)		(0.026)
GDP growth								
Lagged one year							0.017*	0.036**
							(0.008)	(0.012)
Lagged two years							-0.012	-0.014
							(0.008)	(0.011)
Num.Obs.	629	629	629	629	613	613	613	613
AIC	760.0	799.0	797.7	757.7	756.8	774.3	779.2	751.9
BIC	768.9	807.9	806.6	775.4	770.0	787.6	792.5	782.9
Log.Lik.	-378.014	-397.499	-396.853	-374.830	-375.380	-384.152	-386.623	-368.970
Pseudo-R^2	0.064	0.008	0.010	0.071	0.040	0.013	0.006	0.061

Significant at: $+$10 percent level; $*$5 percent level; $**$1 percent level.

Notes: This table provides from a probit model to explore determinants of changes in the operational target regime. The dependent variable equals 1 if there is a cluster change, with the clusters illustrated in figure 7. An observation is a document included in the analysis and as described in table 1. Parameter estimates are marginal effects of a change in the control variable. Robust standard errors are in parentheses.
$* \ p < 0.05, \ ** \ p < 0.01, \ *** \ p < 0.001.$

27