

Political Science and Political Economy Working Paper

Department of Government

London School of Economics

No. 2/2006

Does Deliberation Matter in FOMC Monetary Policymaking? The Volcker Revolution of 1979

Andrew Bailey (Bank of England)

Cheryl Schonhardt-Bailey (LSE)



THE LONDON SCHOOL
OF ECONOMICS AND
POLITICAL SCIENCE ■

Does Deliberation Matter in FOMC Monetary Policymaking?

The Volcker Revolution of 1979

Andrew Bailey*
Bank of England
Threadneedle Street
London EC2R 8AH
andrew.bailey@bankofengland.co.uk

Cheryl Schonhardt-Bailey
Government Department
London School of Economics and Political Science
Houghton Street
London WC2A 2AE
c.m.schonhardt-bailey@lse.ac.uk
<http://personal.lse.ac.uk/schonhar/>

Prepared for delivery at the 2006 Annual Meeting of the American Political Science Association, August 30th-September 3, 2006. Copyright by the American Political Science Association.

**The views expressed in this paper are those of the authors and do not represent the views of the Bank of England.*

I. INTRODUCTION

Abrupt policy changes—particularly ones that produce dramatic consequences for a nation's population and economy—are fascinating to study but awkward to explain. Traditional voting models and econometric tools are better suited to explaining more regular patterns in policymakers' behaviour than abrupt shifts in such behaviour (not least because patterned behaviour is more frequently observed). Indeed, unexpected major policy changes are rare, partly because policymakers prefer to avoid the uncertainty and risk (both economic and political) associated with such decisions.

In monetary policy, decision makers seek to influence the expectations of agents in ways that can avoid making abrupt, dramatic and unexpected decisions. Yet in October 1979, Chairman Paul Volcker led the Federal Reserve's Federal Open Market Committee (FOMC) unanimously to shift its course in managing U.S. monetary policy, which in turn eventually brought the era of high inflation to an end. His successor, Alan Greenspan, described the so-called Volcker Revolution as a "turning point" in the economic history of the U.S. which "rescued our nation's economy from a dangerous path of ever-escalating inflation and instability." (Greenspan 2005: 137)

While some analysts argue that "the presence and influence of one individual" –namely, Volcker—is sufficient to explain the policy shift (Axilrod 2005: 237), this overlooks an important feature of monetary policymaking. Chairmen of the FOMC—however omnipotent they may appear—do not act alone. They require the agreement of other committee members, and in the 1979 revolution the decision was unanimous. A unanimous decision of such magnitude was no small feat, particularly in the wake of the scale of division within the FOMC under Volcker's predecessor, G. William Miller (Greider 1987: 66, 78). How, then, did Chairman Volcker manage to bring a previously divided committee to a consensus in October 1979; and moreover, how did he retain the support of the committee throughout the following

year in the face of mounting political and economic pressure against the Fed? The key to the Volcker Revolution rests in understanding not just Volcker's "presence and influence" but how he managed to *persuade* other committee members to endorse a policy that in the short run would be politically unpopular and economically painful for the nation, but in the long-run would deliver sustained lower inflation and in the process would lead Americans *to expect* stable prices to persist. In short, to understand the Volcker Revolution is to understand the genesis of the Fed's *credible commitment* to lower inflation.

The paper begins by reviewing the story of monetary policy in 1979, leading up to the revolution in October, and the difficulties of the year that followed. Next, we review the more standard accounts of the revolution, and how much or little they might explain the lines of argument used to achieve unanimity in the FOMC in favour of the revolution. Our focus is on the role of the Chairman as the force for change and consistent with this we summarise three rationales that Volcker might have used to persuade his colleagues to support the policy change. We then describe our methodology of automated content analysis as we apply it to the discourse of the FOMC (with this discourse recorded in the verbatim transcripts of meetings). In applying this methodology, we are able to produce a number of analytical tools to represent the discourse and how it changed over time. We use these tools to assess the force of the arguments used by Chairman Volcker.

To briefly summarize our findings, we find that deliberation in the FOMC did indeed "matter" both in 1979 and 1980. Specifically, Volcker led his colleagues in coming to understand and apply the idea of *credible commitment* in U.S. monetary policymaking. What is particularly novel here is that we are able to discern (a) the arguments upon which Volcker relied to gain the initial consensus for the policy shift, and differentiate these from (b) the core rationale that he employed to sustain agreement in the midst of the turbulence over the subsequent year. Our

analysis allows us, in short, to identify and measure empirically Volcker's strategy in shaping the deliberations of the FOMC both over the short and long-run. Our focus on the importance of the ideas of "monetarism" and "credibility" is not new; however, our approach is novel in allowing us to measure empirically and statistically the development of these ideas within the committee setting.

II. THE VOLCKER DISINFLATION: THE STORY OF THE FOMC IN 1979

a. The Shift in 1979

During much of 1979 economic forecasts, including those produced within the Federal Reserve System itself, were pointing towards an oncoming recession in the U.S. economy. At the same time, there was a growing realisation that past inaction by the FOMC was contributing to deteriorating inflation expectations (in the face of the rapid increase in energy prices) and instability in financial markets. In his public speeches and congressional testimony, Volcker explained that not only was spiralling inflation (at an annual rate of around 14%) having harmful effects on the economy itself, but Americans had come to expect inflation as inevitable (Greider 1987: 76; Volcker and Gyohten 1992: 164) and their actions created further inflationary pressures - e.g., workers demanded higher wages, retailers raised prices in anticipation of rising costs, and investors postponed investments. In Volcker's view, monetary policy was the only tool to address inflation, but the Fed lacked credibility in managing this tool: "It was not just that other policies seemed to be caught in a sort of political paralysis, but that no other approach could be successful without a convincing demonstration that monetary restraint would be maintained" (Volcker and Gyohten 1992: 165). Volcker's conundrum was how to provide such a demonstration. For this, he required firm support from his colleagues on the FOMC.

Until July 1979, however, William Miller chaired the FOMC, while Paul Volcker was a permanent voting member as President of the Federal Reserve Bank of New York. The Federal Reserve Board during Miller's eighteen month tenure as Chairman was short of numbers and

inexperienced in terms of average tenure. Meanwhile the FOMC as a whole¹ was divided over its view of the economic outlook, its primary policy objective and the appropriate tactics that it should use—though it adhered to the established approach of targeting the Federal Funds interest rate (Lindsey, Orphanides et al. 2005).

Miller sought consensus in the FOMC but rarely achieved it: at the February FOMC meeting one member voted for a tighter stance, in March there were four such dissents (including Volcker), in April three dissents (including Volcker again), while in May there were two dissents for looser policy and one for tighter. In each of the two June votes there was one dissent on either side (tight and loose), while in July Miller finally achieved his desire of a unanimous vote. At that point he left the Fed to become Treasury Secretary in the Carter Administration. During the first part of 1979, up to Miller's departure, policy was tightened three times, so that the target for the Fed Funds rate rose from 10 to 10 1/8% at the start of the year to 10 ½ to 10 5/8% in July.

Volcker succeeded Miller as Chairman at the end of July. At the August FOMC meeting, when the target range was raised by ¼%, there were two dissents, one for a larger move up and one for a smaller move. At the FOMC meeting on 18th September, Volcker proposed an increase in the target range to 11 ¼ - 11 ¾%. The vote was eight to four (with three dissents for tighter policy and one for looser policy). The Fed did not, as was customary, publish immediately the voting on the target, nor the target itself. Instead, the FOMC instructed the Open Markets desk at the Federal Reserve Bank of New York to aim for this target, leaving market participants and others to infer the movement in the target. But adjacent to the FOMC meeting, on 18th September, the Fed Board voted to raise the Discount Rate (the official rate on borrowing by banks from the Fed's Discount Window). The vote was split, with four in favour and three dissents for easier policy. The significance of the vote on the Discount Rate was that, unlike the FOMC vote, it was published immediately, as was the rate. So the publication of such a close vote gave an impression that the Fed might waver in its path of tightening policy. In Volcker's

words, "(t)he whole maneuver was therefore counterproductive in seeming to send a message that inflation could not be, or would not be, dealt with very strongly" (Volcker and Gyohten 1992: 165). This created substantial disruption in financial markets, and the experience is often cited as the immediate reason for the abrupt change in policy. Indeed Volcker has noted that the incident "made a large impression on me because it was further confirmation . . . [that] markets had developed a high degree of cynicism about the willingness of what they dismissed as 'Washington' in general, or the Federal Reserve in particular, to stand firm. . . . (W)e [were] always reacting too slowly and too mildly only after the evidence was abundantly clear, which by definition was too late" (Volcker and Gyohten 1992: 166).

The nub of the problem in Volcker's view was that the Fed's focus on interest rates (i.e., its targeting of the federal funds rate—the wholesale price for overnight loans among banks) created both a psychological and political barrier to tightening monetary policy significantly, inasmuch as fears of recession would raise the spectre of "political flak" against the Fed (Volcker and Gyohten 1992: 166). Hence, Volcker envisaged a new operating target. Rather than targeting interest rates, an alternative strategy would entail targeting the money supply—in short, the new target would be the quantity of money in the system rather than its price. While Volcker did not embrace the "extreme claims" of monetarism, he was attracted to monetarists' emphasis on stagflation (unemployment and inflation rising together) and their claims that failure to control inflation immediately would risk a larger recession in the future. He thus became disillusioned with the presumed trade-off between unemployment and inflation (the Phillips Curve), which in his words, "did not seem to be working well" and became willing to explore the monetarists' emphasis on controlling the money supply (Volcker and Gyohten 1992: 167).

The backdrop to Volcker's new plan was a divided FOMC, consisting of (broadly defined) "liberals", "conservatives" and "monetarists". Liberals on the committee--Nancy Teeters, Emmett Rice, "Chuck" Partee—focused on the presumed trade-off between inflation and

unemployment; according to Partee, "a little inflation" was "a good thing" in that it "lubricated the economy and it was better to have low unemployment" (Greider 1987: 81). In contrast, conservatives like Henry Wallich and Phil Coldwell (and less stridently, Volcker and Fred Schultz) equated inflation to governmental "fraud" inasmuch it devalued assets and debased money; the priority for the Fed should be to stabilize prices (Greider 1987: 81).

Lawrence Roos (President of the St. Louis Fed, dubbed the "guerrilla outpost for monetarism within the Federal Reserve System" (Greider 1987: 97)) and to a lesser degree other bank presidents (Robert Black of Richmond, John Balles of San Francisco, Monroe Kimbrel of Atlanta) formed a group of monetarists within the FOMC (Greider 1987: 98). Monetarists faulted Keynesian economics for failing to explain why inflation and high unemployment were occurring simultaneously and blamed the Fed for irresponsibly manipulating the money supply. Monetarists argued that the Fed should apply a monetary rule, where the money supply should be expanded at a fixed rate. Roos, the primary monetarist on the FOMC, criticized the Fed for failing to set and adhere to long-term goals and for its lack of transparency: "Even though it's a central bank and central banks love to be secretive and mysterious, I think the Fed should tell the American public where it intends to be in two years, its long-range goals for prices, for output and other things" (quoted in (Greider 1987: 97)).

The main cleavage in the committee was between the conservatives, who supported sharp interest rate increases to halt inflation, and liberals who felt this unnecessary and worried about voting directly for an escalation of interest rates. Both camps were, however, united in their contempt for the monetarist philosophy: in their single-minded focus on *money*, monetarists failed to understand the complexities surrounding central banking.

Prior to the unannounced FOMC meeting on Saturday 6th October, Volcker canvassed other members for their support for his "monetarist solution" that is, shifting from targeting the Fed Funds rate to targeting non-borrowed reserves by the member banks of the Federal Reserve

system (but with no fixed monetary rule). Wallich and Coldwell opposed the idea, fearing the inevitable volatility in interest rates that would result, but Volcker viewed the volatility—and the uncertainty it would generate—in a more favourable light. With more uncertainty, banks would curtail their lending for speculative purposes—and even more so as Volcker proposed an added reserve requirement of 8% on bank lending. In Volcker's view, the message of 6th October was very simple: "We meant to slay the inflationary dragon" (Volcker and Gyohten 1992: 170).

b. The Aftermath in 1980

The record of the FOMC in 1980 is dominated by the rollercoaster pattern of interest rates and the growth of the narrow monetary aggregate (M1) which was the subject of most attention when deciding how to set the objective for non-borrowed reserves. The Federal Funds Rate began the year at around 18%, fell to 8% in June, and was just under 20% in December. At the start of the year there were signs of some slowing in the rate of growth of credit extension, but with inflation remaining over 15%. In the middle of March, at the instigation of the Carter Administration, the Fed announced a series of emergency credit controls designed to slow further the growth of bank lending. Volcker later described the early months of 1980 as witnessing "a palpable sense of growing political panic as well as economic distress" (Volcker and Gyohten 1992: 170). The package was delivered without enthusiasm by the Fed. The controls were minimal in their extent, but their effect was not; there was a sharp contraction in US economic activity in the second quarter, unemployment rose by 1.5 percentage points to 7.8% in July, and there was a contraction in the M1 money aggregate.

This sharp contraction in activity posed the fundamental challenge to the new monetary framework. Should the FOMC stick to its framework and accommodate the contraction, thereby loosening monetary policy and allowing interest rates to fall sharply? Or should it stand against this literal interpretation of the framework on the view that it would take a stronger lead (and thus tighter policy) to establish persistent low inflation? The key question was which of these two approaches

would better enhance the credibility of monetary policy. Initially Volcker retained the view that credibility came from sticking with the announced framework even though that meant a sharp loosening of policy. Some FOMC members dissented: Governor Henry Wallich persistently dissented, taking the view that tighter policy was needed to reduce inflation on a lasting basis. He was joined in May by Presidents Solomon (New York) and Guffey (Kansas), who were concerned at the volatility of interest rates that was the consequence of applying a monetary target rigidly. In late May, Volcker agreed to compromise somewhat on the automatic nature of the monetary adjustment, but this attracted dissent from opposite sides—President Roos of St. Louis who was the leading advocate of rigid monetary targeting, and Governor Partee, who opposed a narrow approach as a principle but found the easing created by the rigid policy framework attractive to his desire to see more stimulus.

Between May and July the credit controls were removed. The contraction in economic activity turned out to be very brief: M1 growth was well above target by August. By September the FOMC was faced with the need to tighten policy sharply, and in the face of the upcoming presidential election. Policy was tightened, but with four dissents within the FOMC in favour of even sharper tightening. The Fed's actions drew criticism from President Carter on the campaign trail, but with no effect. At each FOMC meeting for the remainder of the year (before and after the election) policy was tightened further.

Volcker later described the easing of policy in the Spring of 1980 as perhaps his largest mistake as Chairman, though he also regarded 1980 as a "holding operation" during which the rate of inflation did not worsen (Greider 1987: 218-221). The volatility of policy during the year also led to extensive scepticism outside the Fed. Volcker's overwhelming concern was that the credibility of monetary policy depended on staying the course with the policy framework. The technique was moderated during the year to allow policy to remain somewhat tighter than the automatic rule would have suggested (which subsequently drew repeated dissents from Governor Teeters), but the essence of the framework remained in place.

III. EXPLANATIONS FOR THE VOLCKER REVOLUTION

a. The Political Explanation

Of the many explanations offered for the Volcker Revolution, Greider's is perhaps the simplest. Greider argues that Volcker's monetarist solution offered a way to bridge the divide between two camps in that it served "as a veil that cloaked the tough decisions": the FOMC could thus publicly claim "that it was no longer pegging its policy on interest rates, but on the level of M-1" and this in turn "would obscure its hand and might deflect the public attacks when interest rates rose sharply. Fed members could explain, disingenuously, that the rising interest rates were attributable to 'market pressures'" (Greider 1987: 106-07). Or, in the more colourful words of CEA Chairman Schultze:

In the mind of the Fed, this whole move was, in the broadest sense, a political move, not an economic move. In theory, the Fed could have kept on raising the bejesus out of the interest rates, but that's what it couldn't do politically. The beautiful thing about this new policy was that as interest rates kept going up, the Fed could say, "Hey, ain't nobody here but us chickens. We're not raising interest rates, we're only targeting the money supply." This way they could raise the rates and nobody could blame them. (Greider 1987: 120)

While neither the conservatives or liberals on the FOMC were converted to monetarism, they saw the solution proposed by Volcker as a politically effective means of gaining the necessary support among the committee members. Greider suggests that in his out-of-meeting discussions with the Fed Board Governors, Volcker achieved a consensus for his proposal, which he then presented to the 6th October FOMC meeting. While Volcker had discussed his idea with the Fed Bank Presidents prior to the meeting, they were unaware of any firm proposal when they arrived at the meeting. With the support of the Board members, this left the Bank Presidents to persuade (though, as several were monetarists, their support seemed likely). During the all day meeting, Volcker played devil's advocate, prolonging the discussion in an attempt to get members fully to understand that more volatile and, in the short run, much higher interest rates were the likely

consequences. According to Fred Schultz, "Paul was masterful. . . . I knew exactly what he was doing. The others ended up arguing with him, talking him into doing it. By the end of the day, he had them fully committed" (Greider 1987: 123).

While Greider's extensive account is compelling, it provides less insight into the sorts of arguments that Volcker used to gain the full commitment of his colleagues. The beliefs of the conservatives, liberals and monetarists were firmly embedded, and may have coincided with their partisan orientation.² But merely ascribing the policy shift to political expediency or other political motives gives short shrift to the intellectual competence of FOMC members as they sought the "best" remedy to the inflationary spiral. Members held firm beliefs about inflation and yet their actions in October 1979 raise the possibility that these beliefs may have undergone a fundamental shift. If such a shift in beliefs occurred, how do we measure it? Moreover, if their beliefs changed in late 1979, how stable were these new beliefs, particularly in coping with the economic and political pressures of 1980, as the costs of the new policy rose sharply? In short, a political explanation might provide a rationale for the political expediency in the immediate policy shift, but it reveals nothing about the underlying beliefs of FOMC members under the leadership of Volcker nor does it explain why they remained committed to the new policy in the face of economic challenges over the subsequent year.

b. Economic Explanations

Previous studies have noted inherent difficulties in accounting for the Volcker Revolution using standard macroeconomic models (Primiceri 2005). Likewise, the behaviour of individual monetary policymakers in the Volcker Revolution cannot be explained using standard reaction function approaches (Chappell, McGregor et al. 2005) because of the short lifetime of the regime established by the revolution (under three years) and the lack of precision in the announced operating target of policy (the dependent variable in a reaction function). Indeed, in their recent empirical investigation of decision making by the FOMC, Chappell, McGregor and Vermilyea

appear to agree with Greider that the Volcker Revolution was a political decision that insulated the Fed from responsibility for higher interest rates, and for their reaction function equation, simply create a dummy variable to capture the shift in 1979 (Chappell, McGregor et al. 2005: 15, 36).

Much of the literature on the Volcker Revolution (summarised in Lindsey, et al. 2005) has focussed on explaining the shifting beliefs of policymakers and how these could fit the observed stance of monetary policy. Yet these approaches are problematic in that they (1) require an understanding of the beliefs of policymakers about variables that neither they (as contemporaries) nor later observers could directly observe—the output gap, the natural rate of unemployment, and the expected persistence of inflationary pressure incorporated by policymakers into their Phillips Curves. This leads to a deeper issue, namely (2) how we can observe the macroeconomic model that each policymaker used to form his judgments on policy (here we use “model” broadly to mean the framework around which each policymaker organised his thinking and views). Subsequent literature tends naturally to impose a single model in order to provide a more tractable analytical framework, but at the risk of distancing the focus further away from the actual beliefs of policymakers. And to complicate matters, (3) we need to understand the interaction of shocks (in this case to the U.S. economy) and the beliefs (and hence the model) of policymakers (Sargent, Williams et al. 2004).

One response to the limitation of standard macroeconomic models of the Volcker Revolution has been to use a learning approach that allows policymakers to adapt the parameters of their models over time. Some authors have suggested that rather than FOMC members making persistent mistakes during the so-called Great Inflation of the 1960s and 1970s, they displayed slow learning via adapting their expectations on, for instance, the natural rate of unemployment (Sims 1988; Cho, Williams et al. 2002; Sargent, Williams et al. 2004). This learning explanation suggests that policymakers updated their beliefs about the unobserved variables of their model of

the economy in every period, and they implemented policy conditional on their current beliefs.³

The danger with this approach is that, as ex post analytical tools, learning approaches become exercises in retro-fitting to the data, that is, parameterising to fit the change in the beliefs of policymakers as revealed by their decisions.

A second response to the limitations of macroeconomic models has been to emphasise the role and impact of a new idea(s) on policymakers (Romer 2005). Here, too, there is a danger of retro-fitting. Ex post, we can observe the development of an idea, and hence it is attractive to tie that idea in to the observed decisions of policymakers. Yet without observing directly the beliefs of policymakers we are unable to test whether the idea really influenced their beliefs. According to the ideas explanation for the Volcker Revolution, a new idea—namely, that policymakers will stand a greater chance of achieving their desired outcomes if they are able to make credible commitments (in the sense that the public believes them) about the policies they will follow in the future—triumphed quite suddenly. This idea originated in the famous 1977 article by Finn Kydland and Edward Prescott (Kydland and Prescott 1977), one of whose examples was the effect of a credible commitment by monetary policymakers to future low inflation on the inflation expectations and hence wage and price increase demands of the public.⁴

In sum, a common limitation of the academic literature (both of the macroeconomic models and the subsequent corrections to these models) is that it lacks direct observation of why and how policymakers reached their decisions. An obvious, but at first glance perhaps idealistic, alternative approach would be to find a body of evidence that can be analysed systematically and in doing so provide a direct interpretation of the beliefs of policymakers and how these changed over time (an approach that has been recommended by a recent appraisal of the monetary policy literature (Freeman 2002: 902)). One source would be records of what policymakers said, provided that such textual material can be processed in a systematic fashion. Fortunately, such a source is available for the Volcker Revolution, namely the transcripts of the meetings of the

FOMC. We thus employ a technique that enables full text analysis of the transcripts in order to assess the deliberations surrounding the Volcker Revolution. While the work of Chappell, et al (Chappell, McGregor et al. 2005) takes great strides in analyzing the transcripts of the FOMC, our approach is different in that it focuses exclusively on the deliberations surrounding the 1979 policy shift. In addition, unlike their work, we do not adopt a reaction function approach, nor do we employ partial coding procedures to analyze the transcripts. Rather, we use automated textual analysis to examine the *full verbatim* transcripts of the FOMC in three periods—before, during and after the policy shift.

A key goal in our analysis is to understand better the deliberative process that underpins monetary policymaking. While deliberation is becoming a topical subject among political scientists (Page 1996; Elster 1998; Fishkin and Laslett 2003; Pettit 2003; Austen-Smith and Feddersen 2006), few have sought actually to understand the mechanics of deliberation within a policymaking setting. Indeed, as one author aptly notes, "(u)nwavering faith in deliberation is puzzling because scholars have not clarified how deliberation works" (Barabas 2004). The deliberative process that underpins monetary policymaking is important not only for the policy outcome but also for the reputations of the committee members, and the Fed as an institution. In short, the process must yield a policy outcome that is rationally defensible but also reflects the judgments of individual members (List and Pettit 2002). This paper adopts an empirical approach for understanding the deliberative process, where that process reflects the congealing of monetary policy judgments within a committee setting.

IV. ARGUMENTS FOR THE POLICY SHIFT

Given both the popular accounts of the Volcker Revolution ((Greider 1987; Neikirk 1987; Volcker and Gyohten 1992; Treaster 2004)) and the academic literature, we can distil three prominent arguments that Volcker might have employed to convert his FOMC colleagues in October 1979.

a. Commitment

Volcker might have appealed to the idea of time consistency as developed by Kydland and Prescott (Kydland and Prescott 1977) to persuade colleagues that a changed policy would provide a credible commitment to future low inflation and thus influence the expectations of agents (Chari, Christiano et al. 1998; Christiano and Gust 2000; Christiano and Fitzgerald 2003). If "commitment" had a bearing in the discussions, we should expect to see a greater weight on the importance of the credibility of the monetary policy framework, the expected impact of that credibility on inflation expectations, and the inclusion of expectations in the models of FOMC members (the introduction of an expectational Phillips Curve). FOMC members should be concerned about whether agents would believe their commitment to deliver lasting low inflation.

b. Repentance

Volcker may have persuaded policymakers that the long-run Phillips Curve was vertical, with no scope for assuming a trade-off between inflation and employment and thus overstating the contribution to stabilisation of fine tuning in fiscal policy (Romer and Romer 2002; Meltzer 2005). Support for this explanation would come from evidence that FOMC members both (a) discussed, and (b) changed their position on the trade-off between inflation and employment (notably, a changed position should be evident from the more liberal members—Teeters, Rice, Partee). For those who converted, we should find evidence that they had come to accept the idea of a vertical slope on the Phillips Curve. We should expect to see FOMC members devoting considerable (i.e., statistically significant) attention to inflation and output/employment.

c. Money Matters

Volcker may have persuaded his colleagues that they had underweighted the role of money in their model(s) of inflation (Meltzer 2005). While Volcker never embraced monetarism as a philosophy, he may well have persuaded the anti-monetarists to accept the role of money in the

inflation process. Evidence of FOMC members merely describing their preferred target ranges for money would be necessary but insufficient.

While other arguments may have swayed the committee members, most research on the Volcker Revolution points to (1) the idea of credible commitment, (2) the shape of the Phillips Curve, and/or (3) the role of money in the inflation process as key rationales for the policy shift. Yet, it is unclear the extent to which Volcker employed any (or all) of these arguments in the critical October 1979 meeting. Even more important than what may or may not have persuaded the FOMC in 1979 is the persistence of their new opinions in the face of the economic and political storms of 1980. It is, of course, conceivable that any deliberation in the October 1979 meeting was a complete charade in that the monetarist solution was simply the lowest common denominator upon which they could all agree to confront the inflationary "dragon". Yet, if this were true common sense would suggest that turbulent times would quickly strip away the flimsy veil of agreement to expose the underlying dissension and conflict among the liberals, conservatives and monetarists. One would not expect the FOMC to hold steady to its new operating mechanism throughout the economic and political storms of 1980. Yet, hold firm is exactly what the FOMC did. What, then, was the glue that held the committee together in the face of the turbulence and uncertainty of 1980? Our findings below suggest that Volcker's solution represented far more than the lowest common denominator. Underpinning his new approach was a powerful idea that would in time break the back of the inflationary spiral.

V. METHODOLOGY

Computer-assisted (automated) content analysis—such as Alceste—offers a way to surmount the difficulties of traditional content analysis, while at the same time producing results that are entirely consistent with it (Allum 1998; Bauer 2000). Alceste stands in stark contrast to classical content analysis in a number of ways. First, it is an automatic procedure which thus both guards against researchers and coders infusing their own biases into the coding, and avoids the issue of reliability that

arises with human coding. Second, it can provide an impression of a voluminous data corpus within a very short space of time, which in turn means that sampling may not be required and so problems of sampling may disappear entirely.

Automated content analysis of political texts has, moreover, captured the attention and imagination of political scientists (Gabel and Huber 2000; Laver and Garry 2000; Garson 2002; Laver and Benoit 2002; Laver, Benoit et al. 2002; Monroe and Maeda 2004; Quinn, Monroe et al. 2006), and has received well-deserved praise: "The ability to analyze vast amounts of text quickly and cheaply has the potential to revolutionize the study of politics" (Laver, Benoit et al. 2002, 3).

Alceste relies upon co-occurrence analysis, which is the statistical analysis of frequent word pairs in a text corpus. Alceste was developed by Max Reinert (Reinert 1983; Reinert 1998) and was originally used in the humanities (Reinert 1993), although its use has recently spread to the social sciences (Noel-Jorand, Reinert et al. 1995; Lahlou 1996; Allum 1998; Lahlou 1998; Wagner and Kronberger forthcoming) and to political science (Brugidou 1998; Brugidou 2000; Bailey and Schonhardt-Bailey 2005; Schonhardt-Bailey 2005; Schonhardt-Bailey 2006).⁵ In simple terms, it may be described as a marriage of textual and statistical analysis (Popping 2004).

Because Alceste is automatic (that is, the categories are generated by the program, not by the researcher), it is different from other qualitative software that supports manual content analysis—e.g., Atlas.ti or Nudist (Barry 1998), although it is similar to TextQuest and Leximancer in facilitating quantitative analysis. In short, a variety of packages are on offer for automated content analysis. While other programs are useful for some purposes, Alceste is better suited for an analysis of FOMC transcripts for three reasons. First, following minimal editing, the text is ready for analysis. Second, Alceste proposes classes (or themes) based on word lists and characteristic phrases. Both key words and sentences are, moreover, ranked in terms of their statistical significance, and both can be traced back to the original text so that we may evaluate their context. Third, the technique generates

correspondence analysis so that the speaker (and tags associated with speakers) may be mapped onto the same policy space as the identified classes or themes.

There are two preconditions for good results with Alceste: (1) the textual data must be coherent (that is, it must focus on one topic); and (2) the text must be large enough for the statistical output to be relevant (with a minimum of 10,000 words). The software is particularly adept at analyzing naturally occurring (or non-reactive) textual data (Kronberger 2004). The FOMC transcripts fit these preconditions precisely: the speeches all relate to monetary policy, the total word count for the text files ranges from around 100,000 to 250,000 words, and the textual data are non-reactive.

Alceste determines word distribution patterns within a text, with the objective being to obtain a primary statistical classification of simple statements (or "contextual units")⁶ in order to reveal the most characteristic words, which in turn can be distinguished as word classes that represent different forms of discourse concerning the topic of the text.⁷ Following an iterative process, the descending hierarchical classification method decomposes the classes until a predetermined number of iterations fails to result in further divisions. The result is a hierarchy of classes, which may be schematized as a tree diagram.

VI. ANALYZING FOMC TRANSCRIPTS WITH ALCESTE

We use full text analysis software to discern which of the rationales appears to have the most support based on what was said by FOMC members over the period immediately before, during and after the Volcker Revolution. By full text we mean that the software literally analyses every spoken word and through that maps a framework of argument and associates different elements of that framework with individual policymakers. In contrast with the partial coding of other analyses of these transcripts (Meade 2004; Meade and Stasavage 2004; Chappell, McGregor et al. 2005), we use the *full transcripts* of meetings of the FOMC of the U.S. Federal Reserve. Our approach enables us to weight numerically the relative importance of the main identified themes and the significance (using χ^2 values) of the association of individual

policymakers with the themes. This should allow us to measure the positions of policymakers in 1979 under Miller's chairmanship, and in 1979 and 1980 under Volcker.

Table 1 provides a summary of the basic statistics for the three periods surrounding the Volcker Revolution and, for sake of comparison, equivalent statistics for two years under the chairmanship of Alan Greenspan (1992 and 1998). In terms of the structure of the data for this paper, 1979(Miller), 1979 (Volcker) and 1980 (Volcker) form three text files where each speech or interjection by a committee member constitutes a "case" and each is identified (or "tagged") with identifying characteristics. Here, we have just two tags--the name of the speaking member and for the two 1979 files, the date of the meeting. The analysis produces χ^2 values for these tags as they relate to each of the classes. Where a policymaker's name tag obtains a high χ^2 value (i.e., 3.84 or greater, with 1 degree of freedom—or statistical significance at 5%) for a given class, the policymaker's comments are likely to be closely related to the thematic content of that class.

[Table 1 – About here]

Under Miller, members made 1064 comments; under Volcker (1979), they made 2362—totalling 3426 for the year. In 1980, members made 3430 comments. In 1992 and 1998, members made significantly fewer comments (1176 and 1677, respectively). Given total word counts of roughly similar length, this suggests that when members spoke in 1979, they tended to speak more briefly than members did in the 1990s. (This probably reflects the more structured meeting format adopted in the Greenspan regime.⁸)

An "Elementary Context Unit", or ECU, is constructed by Alceste based on word and punctuation patterns in the text, and can be thought of as representative sentences for each class. (Tables 2, 3 and 4 provide examples of ECUs.). ECUs are then classified, following the same procedure for word classification.⁹ From Table 1 we can see that in the two Greenspan years, a higher percentage (81 to 83%)¹⁰ of the retained ECUs were classified than under Miller (68%) in 1979 or Volcker in 1979 (76%). However, FOMC meetings under Volcker in 1980 attain the

same higher percentage classification (83%) as the Greenspan years. Our interpretation of the higher classification rates for Volcker (1980) and Greenspan (1992, 1998) is that the content and format of these meetings were more focused than under Miller or the early Volcker meetings.

The final two rows in Table 1 indicate the number of classes identified in each file and the relative size of each class (as measured by the percentage of the total ECUs classified within each). We have added the labels for each class (e.g., *US Economy*, *Uncertainty and Deliberation*, and so on) based on an analysis of the most characteristic words for each class (those with high χ^2 values)¹¹ and the most representative ECUs for each class. Tables 2 through 4 provide examples of the top representative words and ECUs for each class. Additionally the characteristic words within each ECU are indicated in bold. As an example, for the Miller era, we have labelled Class 1 "U.S. Economy (stronger inflation; weaker demand and output)". Our labelling of this and other classes stems not only from the top representative words and gauged sentences (ECUs) given in Table 2 (i.e., price/prices, energy, oil, inflation/inflationary, food, with χ^2 values of 347, 128, 119, 110, and 93; and ECUs referring to "upward pressure on wages", "prospective inflation", "inflationary situation" and so on), but also from the dozens of other representative words and the list of ECUs for each class that are given in the detailed reports generated by Alceste (summing to around 100 pages for each text file). As both the words and ECUs are ranked by χ^2 values, the relative importance (in terms of statistical significance) of key words and phrases is readily apparent, though of course, providing a descriptive title to convey their meaning is subject to the researcher's interpretation.

Notably, while the Miller period contains six thematic classes and Volcker 1979 contains five, Volcker 1980 is conspicuous in having just three thematic classes—also compared with six themes under Greenspan in 1992 and four in 1998 (Bailey and Schonhardt-Bailey 2005). Volcker 1980 is thus conspicuous in two ways—it attains a higher rate of classification (is more focused)

than the Miller or Volcker eras in 1979, and the range of themes discussed is fairly narrow relative to those under Miller and Volcker (1979) and Greenspan (1992, 1998).

[Tables 2 through 4, and Figures 1 through 6 - about here]

Figures 1 through 6 set out the *relative importance* of and the *relationships* between the classes. Figures 1, 2 and 3 are tree graphs of the classes schematized according to Alceste's descending hierarchical classification procedure (with the percentage distribution indicated in parentheses). The trees group the classes according to similarity in terms of characteristic words and ECUs; the nearer to the left is the link between classes, the more closely they are related (in terms of word and ECU similarity). For illustration, in Figure 1 (the Miller era) Classes 1 and 4—both of which focus on the US economy—are closely related, as are Classes 2 and 3--both of which relate to the monetary stance and members' uncertainty about changing this stance. Classes 1 and 2 in the 1979 Volcker Era (Figure 2) are closely related, as both are concerned with the monetary policy stance and the impact of changing that stance. The key feature of Figures 1-3 is the relative simplicity of the FOMC discussions under Volcker in 1980, and the distinct nature—in terms of size and content—of the "Striving for Credibility" class in that year, with that one class counting for nearly half the classified ECUs. In other words, the FOMC dedicated the lion's share of its discussions in 1980 to the Fed's ability to demonstrate a credible commitment to lower inflation.

The results from Alceste's classification can also be presented graphically as a spatial representation of the relations between the classes (Figures 4 through 6).¹² Here, distance reflects the degree of association.¹³ Correspondence analysis aims to account for a maximum amount of association¹⁴ along the first (horizontal) axis. The second (vertical) axis seeks to account for a maximum of the remaining association, and so on. Hence, the total association is divided into components along principal axes. The resulting map provides a means for transforming numerical information into pictorial form. It provides a framework for the user to

formulate her own interpretations, rather than providing clear-cut conclusions.¹⁵ The first two factors together account for about 55% and 66% of the total association for the Miller and Volcker eras in 1979. Again, the discussions in 1980 are unique: a two-dimensional spatial map captures a full 100% of the variance in the word co-occurrences.¹⁶ This lends yet further support to our interpretation of the FOMC in 1980 as more focused in terms of thematic content than were meetings in the previous two periods (and indeed, more so than under Greenspan in 1992 and 1998, where two factors accounted for 55% and 72% of the variance, respectively).

In the correspondence graphs for the Miller and Volcker eras (Figures 4 through 6), the thematic classes are indicated in bold, while tags for the names of speakers (FOMC members and staff) are color-coded for 1979. All three graphs indicate a basic "dimensionality" along the horizontal axis which divides themes relating to the U.S. economy from the remaining themes—a feature that essentially replicates the separation of the classes in the tree diagrams. The second dimension is, however, less easy to interpret in these graphs.

More important is the spatial positions of the classes and tags. These reveal that FOMC members (Governors and Presidents) and staff (i.e., economists from the Fed who attend meetings and speak in an advisory capacity) tend to cluster around different themes, which in turn suggests that the themes covered by staff members were often distinct from those of the actual FOMC members. In the Miller period (Figure 4), Fed staff focused on the state of the U.S. economy (Classes 1 and 4) and on the Fed's financial markets operations (Class 5), while FOMC members discussed policy-focused topics such as the monetary policy stance (including the uncertainty surrounding changing it—Classes 2 and 3) and target ranges (Class 6). In the 1979 Volcker period (Figure 5), Fed staff again focused on the US economy (Class 5), with some attention also given to the implementation of the new policy stance (Class 3). Meanwhile, FOMC members were again more concerned with issues surrounding the monetary policy framework, such as the transmission mechanism and the impact of changing that policy framework (Classes

1 and 2), and with monetary aggregate ranges (Class 4). In 1980, staff are situated nearer to discussions relating to the U.S. economy (Class 1), while FOMC members focus particularly on the issue of credibility (Class 3), while they overlap in discussing the monitoring of targets (Class 2).

While the spatial graphs provide a visual representation of the data, we can obtain greater precision in measuring the relationships between tags and thematic classes from the levels of statistical significance assigned to each tag. Tables 5-9 summarize the numbers of name tags associated with each thematic class, where the level of χ^2 association is given in terms of statistical significance (using a standard χ^2 table with one degree of freedom). Tables 5 through 7 lend precision to the spatial results in Figures 4 through 6: the staff name tags are highly associated with discussions on the U.S. economy and the Fed's financial markets operations (usually at the 1% level), while the FOMC members' tags are more associated with the monetary policy stance (and uncertainty surrounding it) and target ranges (at the 5% to 1% levels). From Table 6, we observe the one and only member tag for Class 2—the Impact of the Volcker revolution—and not surprisingly this belongs to Volcker himself, and is significant at the 1% level. From Table 7, we see that discussion focusing on the Fed's attempts to gain credibility—which dominates the discussions (at 48% of the classified ECUs)—is significant *only* for FOMC members, while staff focus their attention on the U.S. economy and the monitoring of targets.

[Tables 5 through 9 – about here]

We provide similar tables for the two years under Greenspan (Tables 8 and 9) and find that the tendency for FOMC members and staff to discuss different themes appears to be a more general one. For purposes of this paper, however, the separation of thematic classes by FOMC members and staff helps to illustrate further 1980 as an anomalous year. Not only were discussions more focused, but FOMC members themselves (Governors and Presidents) were *particularly focused on one theme—the Fed's attempt to gain credibility*.

In sum, 1980 appears to be an anomalous year for the FOMC in that discussions covered fewer themes, and of those covered, the Fed's credibility was paramount. In terms of the observed thematic classes in 1980, FOMC members did not expend much effort in re-evaluating the shape of the Phillips Curve or in highlighting the role of money in the inflation process. We thus have a growing suspicion about what held the committee together in the face of the storms of 1980, namely *the goal of demonstrating a credible commitment to lower inflation*. Yet, to see how this idea took hold in 1980, we require a clearer understanding of the interpretation and importance that Volcker and his colleagues placed on credible commitment in monetary policy. In 1979, did Volcker lay out the foundations for developing the idea of credibility and then expand upon this in 1980, once the committee had changed the mechanism? Is it possible to find evidence to suggest that Volcker did indeed "lead the charge" of credibility? And, if this is indeed possible, what is there left to say about the prominence (or lack thereof) of monetarism in the policy shift? To answer these questions we need to look more closely at the actual verbiage of the FOMC discussions.

VII. A CLOSER LOOK AT WHAT FOMC MEMBERS SAID

In this section we set out the evidence from our full text analysis of the transcripts for 1979 that supports or rejects each of the three plausible rationales that Volcker might have used to gain the support of his colleagues, and to keep that support throughout 1980.

a. Commitment

For the Miller period, Classes 2 and 3 ("Uncertainty and Deliberation" and "Caution re: Changing the Monetary Policy Stance") relate to the framework for monetary policy. Together, they account for 30% of the overall distribution of classes and they are closely linked in the tree diagram (meaning that the language used by members often overlapped). The first of these has the larger weight in the overall distribution (19%). All of the 18 significant tags for these two classes belong to members of the FOMC. Of the top (most representative) ECUs¹⁷ for these

classes, three provide the clearest message on the thinking of FOMC members towards the role of commitment in the monetary policy framework (name of member, χ^2 , and *class number*, all in parenthesis):

"Our credibility would be hurt more if we put out some very specific numbers [for the FOMC's target range for monetary aggregates] and can't come near them than if we put out some generalized statement of policy intent, which we know is about the best we can do at this point really." (Chairman Miller, **18**, 2)

"I think we should do all we can to resist a high inflation rate but, as has been observed by some others, there seems to be a limit to the effectiveness of monetary policy as an anti-inflationary instrument given the kind of inflation we are facing at the present time."

(Governor Rice, **26**, 3)

"I feel that we have to recognize the limitations of monetary policy here and save our ammunition, for the moment anyway, but I certainly would watch carefully." (President Mayo, **24**, 3)

From these, we can observe three characteristics of the Miller period. First, while some members at least recognised the importance of policy credibility, their thinking was dominated by a concern that they might lose it, rather than gain it. This seems odd ex post, given the widespread view that the Fed had severely damaged its credibility during the Great Inflation period of the 1960s and 1970s. Second, where a concern to fight inflation was expressed, it was dominated by a greater concern that monetary policy was impotent in the face of the particular shocks. Third, in the face of uncertainty over the effectiveness of monetary policy, FOMC members would tend towards inaction (the risk-adjusted costs of doing something in the face of uncertainty outweighed the costs of doing nothing).

For the 1979 Volcker period, Classes 1 and 2 ("Effectiveness of Monetary Policy – Uncertainty over the Transmission Mechanism" and "Impact of the Volcker revolution (notably

on interest rates) and Communication of the Policy Change”) relate to the framework for monetary policy. Together, they account for 36% of the overall distribution of classes and are closely linked in the tree diagram. The first of these has the larger weight in the overall distribution (22%). From Table 6, there are 13 significant tags for Class 1, the effectiveness of monetary policy—all belonging to FOMC members but *none* of these were Volcker. Rather, Volcker’s tag is highly significant ($\chi^2 = 226$) for Class 2, the impact of the Volcker Revolution and communication of the policy change—and no other FOMC member’s tag is significant for this class. Indeed this is the only class in 1979 for which Volcker’s tag is overwhelmingly dominant.

A closer look at the statements of committee members shows that to the extent that commitment was discussed, it was done so within the context of the effectiveness of monetary policy (Class 1) rather than as part of discussions on the impact of the Volcker Revolution (Class 2). FOMC members’ discussions of commitment within Class 1 suggest that they viewed the credibility of the Fed as something to be gained, not lost (in direct contrast to the Miller era):

“But I don’t think that approach will be a very happy one unless people are pretty confident about our long term intentions. That’s the credibility problem and the confidence we have to establish as I see it, and we haven’t got a helluva lot of time as the recession comes along but particularly if it gets worse.” (Chairman Volcker, **39**, 1)

“If they see our interest rates drop before they see some progress in the fight against inflation, then they are going to believe that we have lost our resolve and, therefore, act accordingly.” (President Guffey, **24**, 1)

“There’s also a possibility of getting some positive mileage from taking a fairly specific posture as to our plans regarding the orientation of monetary policy beyond 1980 because if we’re going to be able to make progress on the inflation front,” (President Baughman, **22**, 1)

"But it seems to me if our major problem is inflation, and we visualize ourselves as being in a box and we're trying to find a way out, then we're pretty much forced to orient monetary policy to a rather long term horizon." (President Baughman, 19, 1)

"I would hope that the Committee would also look at the long range strategy of how we are going to get out of this box that I have tried portray for you." (Governor Coldwell, 18, 1)

These and the other representative ECUs from the effectiveness of monetary policy class suggest that FOMC members envisaged the idea of a credible commitment in terms of the need for the Fed to establish credibility. To the extent that beliefs shifted, this was towards recognising that the benefits of adopting a consistent anti-inflation policy outweighed the costs of doing nothing. Hence, members became more concerned with gaining than losing credibility, and a bias towards action replaced a bias towards inaction.

In 1980, FOMC members spoke clearly in terms of credibility, but in terms of minimizing risk and with a fair amount of uncertainty as to the means to achieving credibility. The single largest thematic class—"striving for credibility"—shows that as the committee grappled with targeting non-borrowed reserves, it was clearly concerned with its ability to communicate the Fed's intentions to the public. For Mayo, the determination to show commitment was clear: *"we have to keep our eye on the ball and dig in"* ($\chi^2 = 21$), and *"I think you can indicate qualitatively how we are leaning in our thinking without getting into quantities and without disturbing credibility"* ($\chi^2 = 17$). For Volcker, credibility was closely linked with the public's confidence in the Fed to *"bail them out"* of serious difficulties: *"on the other hand, the opposite danger is sitting there. The danger is that if people's confidence that they're going to get bailed out of any serious situation were ever seriously challenged, the sense of panic in this economy could be enormous"* ($\chi^2 = 16$). And, for Willes, credible commitment meant that *"the best thing we can do is to lay out for all the world to see a fairly simple policy procedure, a rule that we're going to follow"* ($\chi^2 = 15$). Taken together, the ECUs and representative words for the "striving for

credibility" class illustrate a determination to stay the course and to renew public confidence in the Fed's commitment to managing inflation. Of the 17 significant FOMC member tags for this class, Volcker's tag leads the rest by a fair margin, with Volcker's χ^2 value of 163, and the next nearest (belonging to Corrigan) of 42.

b. Repentance

A simple test of this explanation is whether FOMC members obtain statistically significant tags for classes devoted to inflation and output/employment. For the Miller period, there are two classes relating to inflation and activity in the U.S., Classes 1 and 4. Taken together, they account for 32% of the distribution of classes. But, in terms of statistically significant tags, those for Fed staff outnumber FOMC members by eight to one. The same is true for the 1979 Volcker era, where one class appears to cover inflation and activity in the U.S. (Class 5, accounting for 33% of the distribution of classes), but among the significant tags the staff outnumber FOMC members by five to one; in 1980, Class 1 which focuses on the weakening of the U.S. economy, shows a similar dominance of staff to FOMC members of 7 to 3. The picture is rather different for the two Greenspan years that we use for comparison (Tables 8 and 9). In 1992, two classes cover the state of the U.S. economy (Classes 1 and 5), and the significant tags for FOMC members outnumber the staff by 21 to two. In 1998 there are again two classes (1 and 3) covering this theme, and the significant tags for FOMC members outnumber the staff by 13 to 7. It is also apparent from the tree maps of the Miller and two Volcker periods that the classes devoted to inflation and activity of the U.S. economy are separated from the classes devoted to the framework and stance of policy, most obviously in the two Volcker periods. (This separation is also evident in the tree maps for 1992 and 1998 (Bailey and Schonhardt-Bailey 2005).) So, we appear to have a story that in both the Miller and Volcker periods there was a clear distinction between discussion of economic activity and inflation, and discussion of the policy stance and framework. But, it is telling that the staff, and not FOMC members, dominated the discussion of

the U.S. economy. Thus, we find no clear evidence that Volcker or his colleagues latched onto the *Repentance* rationale for their policy shift (or at least would require it to have been subliminal)

c. **Money Matters**

If Volcker persuaded his colleagues of the importance of the role of money in the inflation process (i.e. that *Money Matters*), we should see evidence of a class(es) that emphasised not just the description of members' preferred target ranges for the monetary aggregates, but also that members were placing more emphasis on inflation as a monetary phenomenon. The precise change made by the Volcker Revolution in the operating procedures of the Fed was to shift from an interest rate target to targeting the non-borrowed reserve holdings of banks (a component of the narrow money aggregate). But an absence of evidence of members focusing on the role of money in the inflation process would tend to confirm the criticism of monetarists that the Volcker Revolution was not a triumph of monetarism.

Our analysis of the Miller period indicates that Class 6 can be categorised as "Target Ranges for Money and Interest Rates". This accounts for 28% of the overall distribution of classes. There are 11 significant tags for this class (Table 4), nine of which belong to members of the FOMC and two belong to staff. In the tree diagram, this class is more closely linked to the classes on the stance of monetary policy and the uncertainty faced by the FOMC. But the representative ECUs for this class are entirely taken up by descriptions of the preferences of FOMC members for the target ranges for money, and *not* by analysis of the role of money in the inflationary process. We do find references to money in the representative ECUs for Classes 2 and 3, suggesting that there was some discussion of the role and contribution of money to inflationary pressures. But these ECUs suggest that FOMC members were confused about the signals from the monetary aggregates:

"We see relationships that go way out of the range of historical experience. We haven't any idea of the validity of the forecast for the monetary aggregates, I'm afraid, and the combination of those two events does not make me want to linger over the aggregates."

(President Volcker, **25**, 2)

"So I'd come out and say that we do know what is happening to the aggregates within the usual guidelines of our interpretation here. I might even go so far as to stick my neck out and say that I think monetary policy has done a good job in the last six or nine months in terms of achieving some slowing in the aggregates." (President Mayo, **19**, 2)

"Inflation is the number one concern that we continue to hear about and its taking its toll. We would be reluctant to put much emphasis at the moment on movements in the aggregates because they are confusing, both to us and to the market as a matter of fact."

(President Kimbrel, **23**, 3)

Two messages emerge from these statements: first, when the monetary aggregates gave conflicting or confusing signals, the tendency was to ignore them; and second, as the third ECU shows, there was a tendency to think of inflation as a problem divorced from the behaviour of the aggregates (even by an FOMC member labelled as a monetarist).

Turning to the 1979 Volcker period, Class 3 relates to the implementation of policy after the Volcker Revolution through the targeting of non-borrowed reserves, while Class 4 covers the description of the monetary aggregate target ranges. Together, they account for 31% of the overall distribution of classes. There are 15 significant tags for these classes, eleven of which belong to members of the FOMC and four belong to staff. The representative ECUs for these classes are entirely taken up by descriptions of the preferences of FOMC members for the target for non-borrowed reserves and the target ranges for money, and again not by analysis of the role of money in the inflationary process. Nor do we find references to money in the representative ECUs for the other classes.

We can apply one further test by using the correspondence analysis maps (Figures 4 - 6) to investigate whether we can see any common pattern of association for those FOMC members known to be more in favour of a stricter monetarist approach. As noted earlier Presidents Roos, Black, Balles and Kimbrel were most drawn towards the monetarist camp (with Roos the strongest identifier) (Greider 1987: 97-8). Figure 4 (Miller period) indicates a correspondence between the positions of Roos, Black and Balles, but less so Kimbrel (consistent with the ECU reported above). In the 1979 Volcker period (Figure 5), the proximity of their positions lessens, and in 1980 (Figure 6), Roos is positioned much further from Black and Balles (with Kimbrel having left the committee). Tentatively we conclude that the monetarist case may have been more actively deployed as a critique of policy under Miller than it was to support the Volcker Revolution. It may well have served as a veil to cloak the Fed's new stance, and distance it from the inevitably high interest rates to follow—but the rationale was superficial and fleeting in its relevance.

We conclude that the *Money Matters* explanation at best fits as an explanation of the Volcker revolution insofar as the targeting of non-borrowed reserves provided a vehicle to achieve greater restraint in policy setting and for achieving consensus among the FOMC. But the evidence does not indicate that FOMC members set out to instigate a policy whose rationale lay in implementing monetarist principles.

VIII. CONCLUSION

Our intention has been to use a study of the Volcker revolution to illuminate two much wider issues of interest to economists and political scientists: first, that it can be important to understand not just why policy changed but also how it happened; and second, that there is a danger inherent in many studies that impose an ex post framework of analysis to understand previous events. The first issue rests on the view that understanding how a policy making process works can help to explain why policy changes take place, or put another way that understanding

the process of deliberation matters. The second issue can be put more simply as the risk that we assume that in the past people used the same frameworks of analysis and decision-making that we use today.¹⁸

From a methodological perspective, we have sought to confront the difficulty of finding a systematic framework of analysis in which to capture and measure the process of deliberation. This is not easy because the challenge is to capture and assess the beliefs of policymakers through a systematic analysis of their sayings in the policymaking process. A systematic and unbiased textual analysis tool appears to be a promising avenue for meeting this objective.

By adopting a case study approach, we seek to understand better the causes and deliberative process of a major policy change, the 1979 Volcker revolution in U.S. monetary policy. Such abrupt policy changes are by their nature difficult to explain using conventional analytical techniques. A good share of the literature on the Volcker Revolution seeks to explain the change in terms of shifts in the largely unobserved beliefs of policymakers. But the danger of this type of approach is that of retrofitting—in other words using the information ex post to fit a model that creates a story of shifts in unobserved beliefs. Such an approach is plausible insofar as it fits the story as observed ex post, but that is of course ultimately a circular process. Moreover, taking this approach almost by definition rules out incorporating into the story that it matters to understand how the policy change took place, in other words that we understand the contribution made by the process of deliberation within the policymaking body, here the FOMC.

Most research on the Volcker Revolution points to (1) the idea of credible commitment, (2) the shape of the Phillips Curve, and/or (3) the role of money in the inflation process as key rationales for the policy shift. Yet this research is unclear as to the extent to which Volcker employed any (or all) of these arguments in the critical October 1979 meeting. Even more important than what may or may not have persuaded the FOMC in 1979 is the persistence of their new opinions in the face of the economic and political storms of 1980.

A key finding that stands out from our analysis is the change in the form and substance of the discourse in the FOMC from the Miller period, through the initial period of the Volcker revolution, and then throughout 1980. The more structured discourse of 1980 is conspicuous. Under Volcker in 1980 FOMC discussions appear to be simpler and more focused, notably with the distinctive focus on the "Striving for Credibility" class in that year, with that one class counting for nearly half the classified ECUs. Thus, the FOMC dedicated the lion's share of its discussions in 1980 to the Fed's ability to demonstrate a credible commitment to lower inflation. Volcker's tag is the single dominant one in the "Striving for Credibility" class in 1980. By contrast, in the second half of 1979, after he became Chairman (i.e. immediately before, during, and after the revolution) the credibility theme is mixed with a theme of "money matters". Volcker then relegated the theme of "money matters" in 1980 in favour of his core theme—credible commitment. *Hence, "money matters" seems to have been important in winning the initial argument, but what sustained agreement through 1980 was the core theme of credible commitment.*

Does understanding the deliberative process have a particular importance in monetary policymaking? There are two reasons why we think deliberation does matter. First, although there is an extensive literature on so-called policy rules (Taylor 1999), no central bank has chosen to set policy by means of using a rule as a form of autopilot (i.e., simply taking the reading from a rule formula and setting policy accordingly). Instead, the output (i.e., a suggested interest rate), usually of looking at several different possible rules, is often used as an input to the deliberative decision making process. Second, around the world, monetary policy is typically decided as a result of a committee process involving multiple decisions makers engaging in a process of deliberation that leads to a vote. The FOMC is an important example of this arrangement. So, there are strong a priori reasons to think that the process of deliberation matters in shaping decisions on monetary policy, and therefore to analyse the contemporary record of

policymaking. The FOMC provides an excellent opportunity to do this because of the availability of full transcripts of its meetings.

Our analysis of the textual evidence suggests that there was a marked shift in the attitude of FOMC members towards the importance of committing to an anti-inflationary policy. But, while there is evidence from our analysis of the importance attached to the role of agents' inflation expectations, this thinking was not set within a formal model of credibility and commitment. The tool for delivering the policy change was to adopt a monetary target (non-borrowed reserves), but again this was not done within a well-articulated framework of the role of money. Finally, we have been able to provide more measured evidence that, as Chairman, Volcker mattered through his contribution in shifting the thinking of the FOMC towards the version of *Commitment* and *Money Matters* described above. We have therefore been able to use a full text analysis tool to build a more measured account of how the Chairman achieved a consensus through use of the deliberative process. Overall, we think that a systematic analysis of dialogue and debate can go a long way to help to establish an appropriate role for ideas and deliberation in shaping policy decisions by isolating the relative importance of different arguments in shaping lines of discussion.

-
- Allum, N. C. (1998). A Social Representations Approach to the Comparison of Three Textual Corpora Using Alceste. London, London School of Economics and Political Science, MSc Dissertation.
- Austen-Smith, D. and T. J. Feddersen (2006). "Deliberation, Preference Uncertainty, and Voting Rules." *American Political Science Review* **100**(2): 209-218.
- Axilrod, S. H. (2005). "Commentary on Lindey, Orphanides and Rasche's "The Reform of October 1979"." *Federal Reserve Bank of St. Louis Review - Special Issue: Reflections on Monetary Policy 25 Years After October 1979* **87**(2): 237-242.
- Bailey, A. and C. Schonhardt-Bailey (2005). *Central Bankers and Big Ideas: Independence, Credibility, Uncertainty and Measurement in FOMC Transcripts*. European Public Choice Society Annual Meeting, Durham (UK).

- Barabas, J. (2004). "How Deliberation Affects Policy Opinions." American Political Science Review **98**(4): 687-701.
- Barry, C. A. (1998). "Choosing Qualitative Data Analysis Software: Atlas/ti and Nudist Compared." Sociological Research Online (<http://www.socresonline.org.uk/socresonline/3/3/4.html>) **3**(3): 1-16.
- Bauer, M. (2000). Classical Content Analysis: A Review. Qualitative Researching with Text, Image and Sound: A Practical Handbook. M. W. Bauer and G. Gaskell. London, Sage Publications: 131-151.
- Benzecri, J. P. (1981). Pratique de l'analyse des donnees: linguistique et lexicologie. Paris, Dunod.
- Benzecri, J.-P. (1973). L'Analyse des Donnees. Tome 1: La Taxinomie. Tome 2: L'Analyse des Correspondances. Paris, Dunod.
- Bernanke, B. S., A. S. Blinder, et al. (2005). "Panel Discussion I: What Have We Learned Since October 1979?" Federal Reserve Bank of St. Louis Review - Special Issue: Reflections on Monetary Policy 25 Years After October 1979 **87**(2): 277-292.
- Bertier, P. and J. M. Bourroche (1975). Analyse des donnees multidimensionnelles. Paris, Presses Universitaires de France.
- Blasius, J. and V. Thiessen (2001). "Methodological Artifacts in Measures of Political Efficacy and Trust: A Multiple Correspondence Analysis." Political Analysis **9**(1): 1-20.
- Brugidou, M. (1998). "Epitaphs. Francois Mitterrand's Image: An Analysis of an Open Question Asked on His Death." Revue Francaise de Science Politique **48**(1).
- Brugidou, M. (2000). "The Discourse of Demands and Action in [French] Trade Union Press Editorials (1996-1998)." Revue Francaise de Science Politique **50**(6).
- Chang, K. H. (2003). Appointing Central Bankers: The Politics of Monetary Policy in the United States and the European Monetary Union. Cambridge, Cambridge University Press.
- Chappell, H. W., R. R. McGregor, et al. (2005). Committee Decisions on Monetary Policy: Evidence from Historical Records of the Federal Open Market Committee. Cambridge, MA, MIT Press.
- Chappell, H. W., R. R. McGregor, et al. (forthcoming, 2004). Committee Decisions on Monetary Policy: Evidence from Historical Records of the Federal Open Market Committee, MIT Press.
- Chari, V. V., L. J. Christiano, et al. (1998). Expectations Trap and Discretion. Economics. Evanston, IL, Northwestern.
- Cho, I.-K., N. Williams, et al. (2002). "Escaping Nash Inflation." The Review of Economic Studies **69**: 1-40.
- Christiano, L. J. and T. J. Fitzgerald (2003). "Inflation and Monetary Policy in the 20th Century." Federal Reserve Bank of Chicago Economic Perspectives **27**: 22-45.
- Christiano, L. J. and C. J. Gust (2000). "The Expectations Trap Hypothesis." Federal Reserve Bank of Chicago Economic Perspectives **24**: 21-39.
- Diday, E., J. Lemaire, et al. (1982). Elements d'analyse des donnees. Paris, Dunod.
- Elster, J. (1998). Deliberative Democracy. Cambridge, Cambridge University Press.
- Fishkin, J. S. and P. Laslett, Eds. (2003). Debating Deliberative Democracy. Oxford, Blackwell Publishing.
- Freeman, J. R. (2002). "Competing Commitments: Technocracy and Democracy in the Design of Monetary Institutions." International Organization **56**(4): 889-907.
- Gabel, M. J. and J. D. Huber (2000). "Putting Parties in Their Place: Inferring Party Left-Right Ideological Positions from Party Manifestos Data." American Journal of Political Science **44**(1): 94-103.

- Garson, G. D. (2002). Researching and Teaching Political Culture through Web-Based Content Profile Analysis. Annual Meeting of the American Political Science Association.
- Greenacre, M. J. (1984). Theory and Applications of Correspondence Analysis. London, Academic Press.
- Greenacre, M. J. (1993). Correspondence Analysis in Practice. London, Academic Press.
- Greenacre, M. J. and L. G. Underhill (1982). Scaling a data matrix in low-dimensional Euclidean space. Topics in Applied Multivariate Analysis. D. M. Hawkins. Cambridge, Cambridge University Press.
- Greenspan, A. (2005). "Chairman's Remarks." Federal Reserve Bank of St. Louis Review - Special Issue: Reflections on Monetary Policy 25 Years After October 1979 **87(2)**: 137-138.
- Greider, W. (1987). Secrets of the Temple: How the Federal Reserve Runs the Country. New York, Simon and Schuster.
- Hayashi, C. (1950). "On the quantification of qualitative data from the mathematics-statistical point of view." Annals of the Institute of Statistical Mathematics, II.
- Kronberger, N. (2004). Personal communication with the author, 24 September.
- Kronberger, N. and W. Wagner (2000). Keywords in Context: Statistical Analysis of Text Features. Qualitative Researching with Text, Image and Sound: A Practical Handbook. M. W. Bauer and G. Gaskell. London, Sage Publications: 299-317.
- Kydland, F. E. and E. C. Prescott (1977). "Rules Rather Than Discretion: The Inconsistency of Optimal Plans." Journal of Political Economy **85(3)**: 473-492.
- Lahlou, L. (1996). "A method to extract social representations from linguistic corpora." Japanese Journal of Experimental Social Psychology **36**: 278-291.
- Lahlou, S. (1998). Penser manger. Paris, Presses Universitaires de France.
- Laver, M. and K. Benoit (2002). Locating TDs in Policy Spaces: Wordscoring Dail Speeches. Trinity College, Dublin.
- Laver, M., K. Benoit, et al. (2002). Placing Political Parties in Policy Spaces. Trinity College, Dublin.
- Laver, M. and J. Garry (2000). "Estimating Policy Positions from Political Texts." American Journal of Political Science **44(3)**: 619-634.
- Lindsey, D. E., A. Orphanides, et al. (2005). "The Reform of October 1979: How It Happened and Why." Federal Reserve Bank of St. Louis Review - Special Issue: Reflections on Monetary Policy 25 Years After October 1979 **87(2)**: 187-236.
- List, C. and P. Pettit (2002). "Aggregating Sets of Judgments: An Impossibility Result." Economics and Philosophy **18**: 89-110.
- Meade, E. E. (2004). "The FOMC: Preferences, Voting, and Consensus." forthcoming, Journal of Money, Credit and Banking.
- Meade, E. E. and D. Stasavage (2004). Publicity of Debate and the Incentive to Dissent: Evidence from the US Federal Reserve, Brookings Institution and London School of Economics.
- Meltzer, A. H. (2005). "Origins of the Great Inflation." Federal Reserve Bank of St. Louis Review - Special Issue: Reflections on Monetary Policy 25 Years After October 1979 **87(2)**: 145-176.
- Monroe, B. L. and K. Maeda (2004). Talk's Cheap: Text-Based Estimation of Rhetorical Ideal-Points. Political Science Dept., Michigan State University.
- Neikirk, W. R. (1987). Volcker: Portrait of the Money Man. New York, Congdon & Weed, Inc.
- Noel-Jorand, M. C., M. Reinert, et al. (1995). "Discourse analysis and psychological adaptation to high altitude hypoxia." Stress Medicine **11**: 27-39.

- Orphanides, A. (2002). "Monetary Policy Rules and the Great Inflation." American Economic Review **92**(2): 115-120.
- Page, B. I. (1996). Who Deliberates? Mass Media in Modern Democracy. Chicago, Chicago University Press.
- Pettit, P. (2003). Deliberative Democracy, the Discursive Dilemma, and Republican Theory. Debating Deliberative Democracy. J. S. Fishkin and P. Laslett. Oxford, Blackwell Publishing: 138-159.
- Popping, R. (2001). "Modal Auxilliaries in Text Analysis." Bulletin de Methodologie Sociologique **70**: 5-22.
- Popping, R. (2003). "Knowledge Graphs and Network Text Analysis." Social Science Information **42**(1): 91-106.
- Popping, R. (2004). email correspondence with author.
- Primiceri, G. E. (2005). Why Inflation Rose and Fell: Policymakers' Beliefs and US Postwar Stabilization Policy. Economics. Evanston, IL, Northwestern University & NBER.
- Quinn, K. M., B. L. Monroe, et al. (2006). An Automated Method of Topic-Coding Legislative Speech Over Time with Application to the 105th-108th U.S. Senate, Harvard University, University of Michigan, Michigan State University, University of Georgia.
- Reinert, M. (1983). "Une methode de classification descendante hierarchique: application a l'analyse lexicale par contexte." Les Cahiers de l'Analyse des Donnees **8**(2): 187-198.
- Reinert, M. (1993). "Les 'mondes lexicaux' et leur 'logique' a travers l'analyse statistique d'un corpus de recits de cauchemars." Langage et societe **66**: 5-39.
- Reinert, M. (1998). ALCESTE users' manuel (English version). Toulouse, Image.
- Rogoff, K. (1985). "The Optimal Degree of Commitment to an Intermediate Target." Quarterly Journal of Economics **100**(November): 1169-1190.
- Romer, C. D. (2005). "Commentary on Meltzer's 'Origins of the Great Inflation'." Federal Reserve Bank of St. Louis Review - Special Issue: Reflections on Monetary Policy 25 Years After October 1979 **87**(2): 177-186.
- Romer, C. D. and D. H. Romer (2002). The Evolution of Economic Understanding and Postwar Stabilization Policy. Rethinking Stabilization Policy. F. R. B. o. K. City. Kansas City: 11-78.
- Sargent, T., N. Williams, et al. (2004). "Shocks and Government Beliefs: The Rise and Fall of American Inflation." National Bureau of Economic Research Working Paper 10764.
- Schonhardt-Bailey, C. (2005). "Measuring Ideas More Effectively: An Analysis of Bush and Kerry's National Security Speeches." PS: Political Science and Politics **38**(3): 701-711.
- Schonhardt-Bailey, C. (2006). From the Corn Laws to Free Trade: Interests, Ideas and Institutions in Historical Perspective. Cambridge, MA, MIT Press.
- Sims, C. A. (1988). "Projecting Policy Effects with Statistical Models." Revista de Analisis Economico: 3-20.
- Taylor, J. B. (1999). Monetary Policy Rules. Chicago, University of Chicago Press.
- Treaster, J. B. (2004). Paul Volcker: The Making of a Financial Legend. Hoboken, NJ, John Wiley & Sons, Inc.
- Volcker, P. and T. Gyohten (1992). Changing Fortunes: The World's Money and the Threat to American Leadership. New York, Times Books.
- Wagner, W. and N. Kronberger (forthcoming). Quantitative and Qualitative Cross-Cultural Comparison: Cultural Metrics. Theoretical and Methodological Advances in Cultural and Cross-Cultural Psychology. J. Straub.
- Weller, S. C. and A. K. Romney (1990). Metric Scaling: Correspondence Analysis. London, Sage Publications.
- Woodford, M. (2003). "Optimal Interest-Rate Smoothing." The Review of Economic Studies **70**(4): 861-886.

¹ The FOMC comprises the seven Governors of the Federal Reserve Board (including the Chairman) and the Presidents of the twelve Regional Federal Reserve banks (five of whom have voting rights on the FOMC at any point in time).

² The partisan nature of the appointments process is explored by Chang. (Chang 2003).

³ To fit such models to history, it is necessary to make assumptions about the weight that policymakers place on recent information, and to what extent they employ a smoothing component that acts against big shifts in policy (Woodford 2003; Primiceri 2005).

⁴ It was not until 1985 that Rogoff filled in the important gap of explaining how a central bank could attain credibility in the first place (Rogoff 1985; Bernanke, Blinder et al. 2005).

⁵ Alceste is described in one account as follows: "Taken together, the program realizes a complex *descending hierarchical classification* combining elements of different statistical methods like segmentation (Bertier and Bouroche 1975), hierarchical classification and dichotomization based on reciprocal averaging or correspondence analysis (Hayashi 1950; Benzecri 1981; Greenacre 1993) and the theory of dynamic clouds (Diday, Lemaire et al. 1982)" (Kronberger and Wagner 2000, 306).

⁶ For Alceste, "statements" are defined as "contextual units." The program automatically determines contextual units with reference to punctuation and the length of the statement up to a maximum of 250 characters.

⁷ Through its dictionary, Alceste prepares the text by reducing different forms of the same word (in the form of plurals, suffixes, etc.) to the root form and transforms irregular verbs to the indicative, thereby producing a matrix of reduced forms. It also subdivides the corpus into "function words" (articles, prepositions, conjunctions, pronouns, and auxiliary verbs) and "content words" (nouns, verbs, adjectives, and adverbs). The content words are understood to carry the meaning of the discourse and the final analysis is based on these. (Content words are sometimes referred to as the "meaningful words.") The program creates a data matrix (an "indicator matrix") which allows an analysis of statistical similarities and dissimilarities of words in order to identify repetitive language patterns. This matrix relates relevant words in columns and contextual units in rows, so that if a given word is present, a 1 is entered in the cell; otherwise, the entry is 0. Then, using descending hierarchical classification analysis, the program identifies word classes. (The term "class" is used for descending hierarchical classification analysis while the term "cluster" is used for the more traditional ascending cluster analysis (Kronberger and Wagner 2000, 308).) The first class comprises the total set of contextual units in the initial indicator matrix. The program then attempts to partition that class into two further classes that contain different vocabulary and ideally do not contain any overlapping words. The methods used for this are optimal scaling and the adoption of a maximum chi-squared criterion for cutting the ordered set of words. Alceste compares the distribution of words in each of the two new classes with the average distribution of words. Different forms of discourse that use different vocabulary will result in an observed word distribution that deviates systematically from one where the words are independent of each other. The procedure searches for maximally separate patterns of co-occurrence between the word classes. The chi-squared criterion is thus used as a measure of the relationship that exists between words, rather than as a test.

⁸ From 1936 until March 1976, the FOMC published (after a five-year lag) a record of each of its meetings in the *Memoranda of Discussion*. As described in Chappell et al (Chappell, McGregor et al. forthcoming, 2004) in 1976 the Fed stopped publication of the *Memoranda*, apparently in response to pending legislation and a lawsuit that would if successful have required earlier publication. But the Fed continued to produce transcripts of meetings for use in producing its published record of policy actions. In 1993, Alan Greenspan acknowledged the existence of these transcripts and soon afterwards agreed to publish them (with some editing) after a five year lag. Currently transcripts are published from 1979 to 1998. There is also some evidence to support the idea that releasing the transcripts itself has the effect of stifling debate, but this would not arise until 1993, after which members may have been constrained by knowing their words were "for the record"—albeit in five years hence.

⁹ The classification follows a specified procedure using chi-squared, and may be illustrated using Kronberger and Wagner's example of the decomposition of an original matrix into two classes (Kronberger and Wagner 2000: 309).

	Specific vocabulary of class 2		Overlapping vocabulary		Specific vocabulary of class 3		
	<i>food</i>	<i>fruit</i>	<i>say</i>	<i>word j</i>	<i>Cure</i>	<i>cancer</i>	
Class 2	45	12	20	k_{2j}	0	0	k_2
Class 3	0	0	21	k_{3j}	33	20	k_3
	45	12	41	k_j	33	20	k

Classes 2 and 3 are optimally separate in that they have as little overlap in words as possible. "The numbers in the table (k_{2j} , k_{3j}) indicate the frequency of contextual units for each class containing a specific word j . In our example, class 2 consists of statements containing words like 'food' and 'fruit', while words like 'cancer' and 'cure' are typical for class 3. Of course, it will rarely be possible to separate statements such that words occurring in one class do not appear in the other. There will always be some overlapping vocabulary, like the word 'say' in the example" (Kronberger and Wagner 2000: 309).

The chi-squared procedure then establishes "out of all possible procedures" two classes that maximize the following criterion:

$$\chi^2 = k_2 k_3 \sum_{j \in J} \left[\left(\frac{k_{2j}}{k_2} - \frac{k_{3j}}{k_3} \right)^2 \div k_j \right], \text{ where}$$

$$k_{2j} = \sum_{i \in I_2} k_{ij}; k_2 = \sum_{i \in I_1} k_{2j}; k_j = k_{2j} + k_{3j}$$

¹⁰ This compares favourably with Laver and Benoit's percent of words scored, which ranged from 81% to 94% (Laver and Benoit 2002: 16-17)

¹¹ The minimum chi-square value for selecting a word is set at 2, 20, 20, 17 and 20, for the Miller, Volcker 1979, Volcker 1980, Greenspan 1992, and Greenspan 1998 transcripts, respectively. The high thresholds for the Volcker and Greenspan transcripts reflect the larger word counts for these text files, and the smaller word count for the Miller file. The basic rule of thumb with Alceste is (as with any data)—the more data, the easier it is to attain statistical significance. Hence, for files with more data, the threshold for statistical significance is set higher (with 20 being the top threshold set within Alceste).

¹² Alceste cross-tabulates classes and words in their root form in order to create a matrix which can then be subjected to factor correspondence analysis (Greenacre 1993). Such correspondence analysis is well-established in the French literature (see (Benzecri 1973) and the journal *Cahiers de l'Analyse des Donnees*) and more recently in English applications (Greenacre and Underhill 1982; Greenacre 1984; Weller and Romney 1990; Greenacre 1993), (Blasius and Thiessen 2001). See (Popping 2001; Popping 2003) for related graphical presentations of qualitative data using computer-assisted text analysis.

¹³ For this, correspondence analysis uses the "chi-squared distance", which resembles the Euclidean distance between points in physical space. However, in correspondence analysis, each squared difference between coordinates is divided by the corresponding element of the average profile (where the profile is a set of frequencies divided by their total). The justification for using the chi-squared concept is that it allows one to transform the frequencies by dividing the square roots of the expected frequencies, thereby equalizing the variances. This can be compared to factor analysis, where data on different scales are standardized. Greenacre provides further geometric reasons for using the chi-squared distance in correspondence analysis (Greenacre 1993: 36).

¹⁴ Correspondence analysis usually refers to the "inertia" of a table, which can also be called "association" (Weller and Romney 1990). A corresponding χ^2 value can be obtained by multiplying the association value by the total n of the table.

¹⁵ The association and χ^2 statistic may be interpreted geometrically as the degree of dispersion of the set of rows and columns (or, profile points) around their average, where the points are weighted.

¹⁶ The circular appearance of this graph is a product of the space being two-dimensional. That is, because the coordinates of points reflect correlation—and the more distant the points are from one another, the less likely

they are to be co-occurrent—the coordinates of points and number of columns analyzed in a two-dimensional space will result in a circular appearance.

¹⁷ Alceste reports the top 20 (19 with smaller text sizes) ECUs from each class, along with their χ^2 values.

¹⁸ A parallel is found in work by Orphanides and others that points to the danger of seeking to explain past decision making in monetary policy using the view of past data that we have now rather than the data that contemporaries actually had at their disposal. In other words, most studies of the past tend to rely on regressions using the (often substantially revised) data available now, rather than the so-called real time data that contemporaries actually had (Orphanides 2002).

Table 1: Comparison of Basic Statistics for FOMC Transcripts in Miller, Volcker and Greenspan Eras

	<i>(a) Miller Era (1979)</i>	<i>(b) Volcker Era (1979)</i>
Total Word Count	98,636	181,441
Unique Words Analyzed	39,923	74,856
Passive Variables (Tagged Indicators)	53	54
I.C.U.s (# of speeches/comments)	1064	2362
Classified E.C.U.s	2156 (=68% of the retained E.C.U.)	4288 (=76% of the retained E.C.U.)
Lexical Classes	6	5
Distribution of Classes (%)	<ol style="list-style-type: none"> 1 US Economy (stronger inflat.; weaker demand & output) (19.2%) 2 Uncertainty & Deliberation (19.3%) 3 Caution re: Changing Monetary Policy Stance (incl. International dimension to policy setting) (10.9%) 4 US Economy Demand & Output (12.4%) 5 Fed. Reserve Fin. Markets Operations (Domestic & Int'l) (10.0%) 6 Target Ranges for Money & Int. Rates (28.2%) 	<ol style="list-style-type: none"> 1 Effectiveness of Monetary Policy - Uncertainty Over Transmission Mech. (22.3%) 2 Impact of Volcker Revolut. On Int. Rates & Communication of the Policy Change (13.7%) 3 Policy Implementation (level of non-borrowed reserves) (16.7%) 4 Monetary Aggregate Ranges (14%) 5 US Economy (demand & inflation outlook) (33.4%)

	<i>(c) Volcker Era (1980)</i>
Total Word Count	254,645
Unique Words Analyzed	103,809
Passive Variables (Tagged Indicators)	48
I.C.U.s (# of speeches/comments)	3430
Classified E.C.U.s	6863 (=83% of the retained E.C.U.)
Lexical Classes	3
Distribution of Classes (%)	<ol style="list-style-type: none"> 1 US Economy (evidence of weakening) (25.86%) 2 Monitoring Targets (reserves target, range for Funds rate) (26.26%) 3 Striving for Credibility (47.88%)

Table 1: (continued)

	<i>(c) Greenspan Era (1992)</i>	<i>(d) Greenspan Era (1998)</i>
Total Word Count	228758	279819
Unique Words Analyzed	97445	122547
Passive Variables (Tagged Indicators)	55	50
I.C.U.s (# of speeches/comments)	1176	1677
Classified E.C.U.s	5082 (=83% of the retained E.C.U.)	5569 (=81% of the retained E.C.U.)
Lexical Classes	6	4
Distribution of Classes (%)	4 US Outlook (wt. on world) (19.72%) 5 Fin. Market Conditions & Ops. By Fed. (13.36%) 6 Monetary & Fiscal Policy Stance (10.04%) 7 Tilt/Bias (6.24%) 8 State of US Regional Economies (22.98%) 9 Difficulty of FOMC's Task (Uncertainty) (27.67%)	1 US Outlook (34.85%) 2 World Outlook & Fin. Markets (15.26%) 3 State of US Regional Economies (16.02%) 4 Voting Arguments/Intentions (33.87%)

Table 2: 1979 FOMC Transcripts (Miller Era): Examples of Most Typical ECUs in each Class

Class	Top represent. words, where “+” truncates to root form	Chi square association (rank)	Selection of E.C.U.s representative of each class (where bold designates words that have been tagged with that class)
1 US Economy (stronger inflat.; weaker demand & output)	price+ energy oil inflation+ food	43 (1)	continued upward pressure on wages , in response to past and prospective inflation is expected to offset the effects of labor market slack; compensation is projected to rise by close to 10 per cent in 1980, somewhat above this year’s expected increase . We expect little help from improved productivity performance in damping the impact on labor costs . (Zeisel)
1		40 (2)	and other deposits subject to rate ceilings , relative to income and interest rates. This is, of course , rational behavior in an inflationary situation. The tax on money as prices rise becomes oppressive and holders shift to other assets , including physical assets . (Axilrod)
2 Uncertainty & Deliberation	think thing+ that’s recession+ staff+	38 (1)	judgments can differ on these things . The alternative explanation is that we’ve simply been very stingy in the provision of reserves. I think some combination of those two might explain where we’re coming out . But as I say , if one looks at the actual components of what goes into the so called substitutes for money, it’s true that money market funds have surged, but the rps have not. (Balles)
2		29 (5)	Frank Morris said that we can’t casually assume the recession will be mild . I suppose we can’t casually assume it, although it looks that way to me now, if we’re going to have one. (Volcker)
3 Caution re: Changing Monetary Policy Stance	international+ exchange+ watch+ president+ speech signal+	51 (1)	This has been #extremely helpful . I gather that, with two possible exceptions, the overall consensus was that we stand pat but be prepared to move as we continue to watch the situation carefully . (Miller)
3		32 (3)	Let me just put out a thought. It seems to me that an international disturbance is a serious concern . It could require that we take some action . (Miller)

Table 2: 1979 FOMC Transcripts (Miller Era): Examples of Most Typical ECUs in each Class, cont.

Class	Top represent. words, where “+” truncates to root form	Chi square association (rank)	Selection of E.C.U.s representative of each class (where bold designates words that have been tagged with that class)
4 US Economy Demand & Output	quarter+ product+ gross+ national+ annual goods	82 (1)	in the construction and business capital investment area the forecast incorporates a stronger pattern of spending in the second quarter than in the first. Housing starts data for March will be available later today, but we have assumed a strong pickup from the weather depressed February pace . (Kichline)
4		76 (2)	industrial production in May only recovered strike related losses of the previous month , and preliminary information for June suggests a slight decline in output . Total retail sales in real terms have declined a substantial 6 1/2 percent from the peak in December . (Kichline)
5 Fed. Reserve Fin. Markets Operations	dollar+ bill+ treasury+ system+ currenc+	114 (1)	this brings our intervention since Sunday night to almost 1.2 billion dollars , which has been equally shared between the system and the Treasury . Since mid June the net intervention by the United States has been 3.6 billion dollars . This compares to the 4.1 billion dollars from our 3 partners in the November 1 package , for Germany and, for Switzerland . (Greene)
5		92 (2)	Given the volatility of market factors affecting reserves , more than usual reliance was placed on adding or absorbing reserves on a temporary basis . Outright operations included purchases of 700 million dollars of Treasury coupon issues early in the period , sales of about 450 million dollars of Treasury bills to foreign accounts about midway through the period , (Sternlight)
6 Target Ranges for Money & Int. Rates	range+ percent+ fund+ M1 M2	50 (1)	the range for M1 would be 0 to 5 percent and the range for M2 would be 4 to 8 1/2 percent . The Fed Funds Rate would initially be at 10 1/4 percent and would move in a range of 9 3/4 to 10 1/2 percent but not below 10 percent without consultation . (Miller)
6		45 (2)	the M1 range is 4 to 8 percent and the M2 range is 3 1/2 to 7 1/2 percent ; the Funds range is 9 3/4 to 10 1/2 percent , with the initial objective at the prevailing rate of 10 to 10 1/8 percent . (Altmann)

Table 3: 1979 FOMC Transcripts (Volcker Era): Examples of Most Typical ECUs in each Class

Class	Top represent. words, where “+” truncates to root form	Chi square association (rank)	Selection of E.C.U.s representative of each class (where bold designates words that have been tagged with that class)
1 Effectiveness of Monetary Policy – Uncertainty Over Transmission Mech.	polic+ think long+ recession+ monet+ risk+	39 (1)	but I don’t think that approach will be a very happy one unless people are pretty confident about our long term intentions . That’s the credibility problem and the confidence we have to establish as I see it. And we haven’t got a helluva lot of time as the recession comes along if indeed it does come along but particularly if it gets worse . (Volcker)
1		27 (3)	When we’re sensitive to those things , there’s certainly a perceived risk of aggravating the recession . I’m not so sure that we’re in the zone where monetary policy itself is all that restrictive in terms of real activity , but there is certainly a perceived risk . (Volcker)
2 Impact of Volcker Revol.	discount+ fund+ federal technique+ rate+	37 (1)	I would not worry myself if the Federal Funds Rate stayed in the 15 1/ 2 percent area, either somewhat above or hopefully somewhat below. Also, I would want to wait for a few days , at least until Thursday , to have a better idea of what is happening . (Rice)
2		36 (2)	Well, if we have a new procedure , I will have a press conference . Whether I have it today or Monday is an open question . (Volcker)
3 Policy Implementation (level of non-borrowed reserves)	reserve+ borrow+ path+ total+ week+ deposit+	56 (2)	In the first portion of the period , the four week block ended December 19 , total reserves turned out, on average , about 40 million dollars above path and non borrowed reserves about 80 million dollars above path , (Sternlight)
3		51 (3)	For the four weeks ending October 31 , total reserves averaged about 390 million dollars above their path level , while non borrowed reserves averaged about 230 million dollars below their path . (Sternlight)

Table 3: 1979 FOMC Transcripts (Volcker Era): Examples of Most Typical ECUs in each Class, cont.

<i>Class</i>	<i>Top represent. words, where "+" truncates to root form</i>	<i>Chi square association (rank)</i>	<i>Selection of E.C.U.s representative of each class (where bold designates words that have been tagged with that class)</i>
4 Monetary Aggregate Ranges	range+ alternative+ prefer+ midpoint+ Mr Chairman top+ M3	67 (1)	Why don't we just see what the vote is, Mr. Chairman , on the bottom of alternative III and the top of alternative II , widening the range by 1/ 2 percentage point . (Mayo)
4		52 (4)	I understand fully what Bob says about narrowing the ranges , and I do agree that there is quite a difference between, say, 4 percent and 7 percent in M1a, (Partee)
5 US Economy (demand & inflation outlook)	price+ product+ quarter+ consumer+ gross+ national	56 (1)	We continue to forecast comparatively small quarterly declines in real gross national product into early 1980 , reflecting weakness in housing , reduced business outlays for both fixed capital and inventories and quite sluggish consumer demand . (Zeisel)
5		42 (2)	the staff forecasts continuing large compensation increases and poor productivity , which together result in little reduction in unit labor costs . In 1981 projected compensation is held up by the huge scheduled increase in social security taxes which will likely feed through to prices rather quickly. (Kichline)

Table 4: 1980 FOMC Transcripts (Volcker Era): Examples of Most Typical ECUs in each Class

Class	Top represent. words, where “+” truncates to root form	Chi square association (rank)	Selection of E.C.U.s representative of each class (where bold designates words that have been tagged with that class)
1 US Economy (evidence of weakening)	product+ dollar+ gross+ national+ decline+	46 (1)	new orders for non defense capital equipment indicate the developing weakness in commitments for longer lead time capital outlays. In conjunction with the decline since early last year in contracts for commercial and industrial construction, these data portend a continued downtrend in fixed capital spending over the balance of this year. (Zeisel)
1		39 (4)	for the current quarter, shipments of non defense capital goods in January were quite strong and construction outlays continued at a high level. There are enough orders and contracts in the pipeline to sustain spending in the near term, but new orders and contracts in real terms appear to have peaked early last year. (Kichline)
2 Monitoring Targets (reserves target, range for Funds rate)	fund+ borrow+ path+ reserve+ percent+	32 (1)	more recently, the rate has been trading more around 9 1/4 to 9 1/2 percent. Since the desk’s reserve targets were consistent with frictional levels of adjustment borrowing throughout the interval, the lower end of the committee’s effective federal funds rate range came into play on several occasions. (Meek)
2		31 (2)	the committee raised the upper bound on the weekly average rate further to 18 percent on March 7, so that the presence of an upper limit has not constrained the desk’s pursuit of reserve objectives. (Sternlight)
3 Striving for Credibility	think problem+ that’s cred+ target+ polic+	22 (2)	we can’t ignore the fact that regardless of what we say and how we interpret the different variables to the public, they are going to make their own reading on it. (Ford)
3		21 (3)	that may make our success in controlling the aggregates seem a little better, but that could provide a false sense of security. I hope we handle it a bit better despite what I said about the basic adequacy of our record. We have to keep our eye on the ball and dig in. (Mayo)

TABLE 5: FOMC in the Miller Era (1979)

Statistical Significance (df = 1)	χ^2 Value	Member (Staff)	Class 1 – US Economy (19.2%)	Class 2 – Uncertainty (19.3%)	Class 3 – Caution re: Monetary Stance (10.9%)	Class 4 – US Economy, Demand & Output (12.4%)	Class 5 – Fed. Reserve Fin. Markets Ops. (10%)	Class 6 – Target Ranges for Money & Int. Rates (28.2%)
N.S.	< 2.71	2 (0)						2 (0)
10 %	\geq 2.71	0 (1)						0 (1)
5 %	\geq 3.84	7 (1)		2 (0)	3 (0)	0 (1)		2 (0)
1 %	\geq 6.64	4 (2)	0 (1)		3 (0)			1 (1)
0.1 %	\geq 10.83	15 (10)	1 (3)	5 (0)	5 (0)	0 (3)	0 (4)	4 (0)
TOTAL		28 (14)	1 (4)	7 (0)	11 (0)	0 (4)	0 (4)	9 (2)

TABLE 6: FOMC In the Volcker Era (1979)

Statistical Significance (df = 1)	χ^2 Value	Member (Staff)	Class 1 – Effectiveness of Monetary Policy (22.3%)	Class 2 – Impact of Volcker Revol. (13.7%)	Class 3 – Policy Implementation (16.7%)	Class 4 – Monetary Aggregate Ranges (14%)	Class 5 – US Economy (demand & inflat. Outlook) (33.4%)
N.S.	< 2.71	1 (0)				1 (0)	
10 %	\geq 2.71	5 (0)	2 (0)		1 (0)	1 (0)	1 (0)
5 %	\geq 3.84	4 (0)	2 (0)			2 (0)	
1 %	\geq 6.64	7 (2)	4 (0)			3 (1)	0 (1)
0.1 %	\geq 10.83	9 (7)	5 (0)	1 (0)	0 (2)	3 (1)	0 (4)
TOTAL		26 (9)	13 (0)	1 (0)	1 (2)	10 (2)	1 (5)

TABLE 7: FOMC In the Volcker Era (1980)

Statistical Significance (df = 1)	χ^2 Value	Member (Staff)	Class 1 – US Economy (evidence of weakening) (25.86%)	Class 2 – Monitoring Targets (reserves target, range for Funds rate) (26.26%)	Class 3 – Striving for Credibility (47.88%)
N.S.	< 2.71	4 (1)		1 (1)	3
10 %	\geq 2.71	1 (0)			1
5 %	\geq 3.84	3 (1)	1	1 (1)	1
1 %	\geq 6.64	2 (1)	1 (1)		1
0.1 %	\geq 10.83	15 (8)	1 (6)	3 (2)	11
TOTAL		25 (11)	3 (7)	5 (4)	17

TABLE 8: FOMC in the Greenspan Era (1992)

Statistical Significance (df = 1)	χ^2 Value	Member (Staff)	Class 1 - US Outlook (Wt. on World) (19.7%)	Class 2 - Fin. Market Conditions & Ops. By Fed. (13.4%)	Class 3 - Monetary & Fiscal Policy Stance (10%)	Class 4 - Tilt/Bias (6.2%)	Class 5 - State of US Regional Economies(23%)	Class 6 - Difficulty of FOMC's Task (Uncertainty)(27.7%)
N.S.	< 2.71	3 (1)	1 (1)			1 (0)	1 (0)	
10 %	\geq 2.71	7 (0)	2 (0)			2 (0)	2 (0)	1 (0)
5 %	\geq 3.84	1 (1)			0 (1)		1 (0)	
1 %	\geq 6.64	2 (0)				1 (0)	1 (0)	
0.1 %	\geq 10.83	28 (10)	5 (0)	0 (6)	1 (3)	5 (0)	8 (1)	9 (0)
TOTAL		41 (12)	8 (1)	0 (6)	1 (4)	9 (0)	13 (1)	10 (0)

TABLE 9: FOMC in the Greenspan Era (1998)

Statistical Significance (df = 1)	χ^2 Value	Member (Staff)	Class 1 - US Outlook (34.9%)	Class 2 - World & Financial Markets (15.3%)	Class 3 - State of Regional Economies (16%)	Class 4 - Voting Arguments /Intentions (33.9%)
N.S.	< 2.71	1 (1)				1 (1)
10 %	\geq 2.71	1 (0)				1 (0)
5 %	\geq 3.84	3 (3)	1 (2)	0 (1)		2 (0)
1 %	\geq 6.64	1 (0)				1 (0)
0.1 %	\geq 10.83	19 (8)	1 (5)	0 (2)	11 (0)	7 (1)
TOTAL		25 (12)	2 (7)	0 (3)	11 (0)	12 (2)

Fig. 1: Tree Graph of the Classes for the FOMC Transcripts, Miller Era (1979)

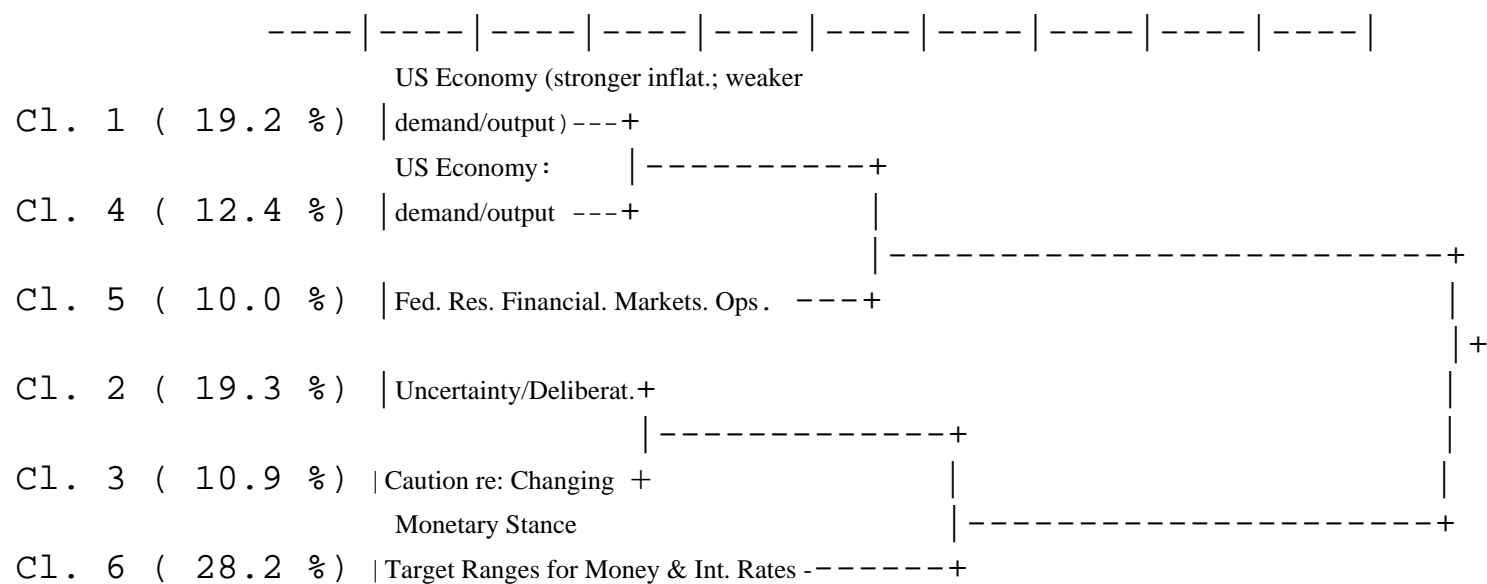


Fig. 2: Tree Graph of the Classes for the FOMC Transcripts, Volcker Era (1979)

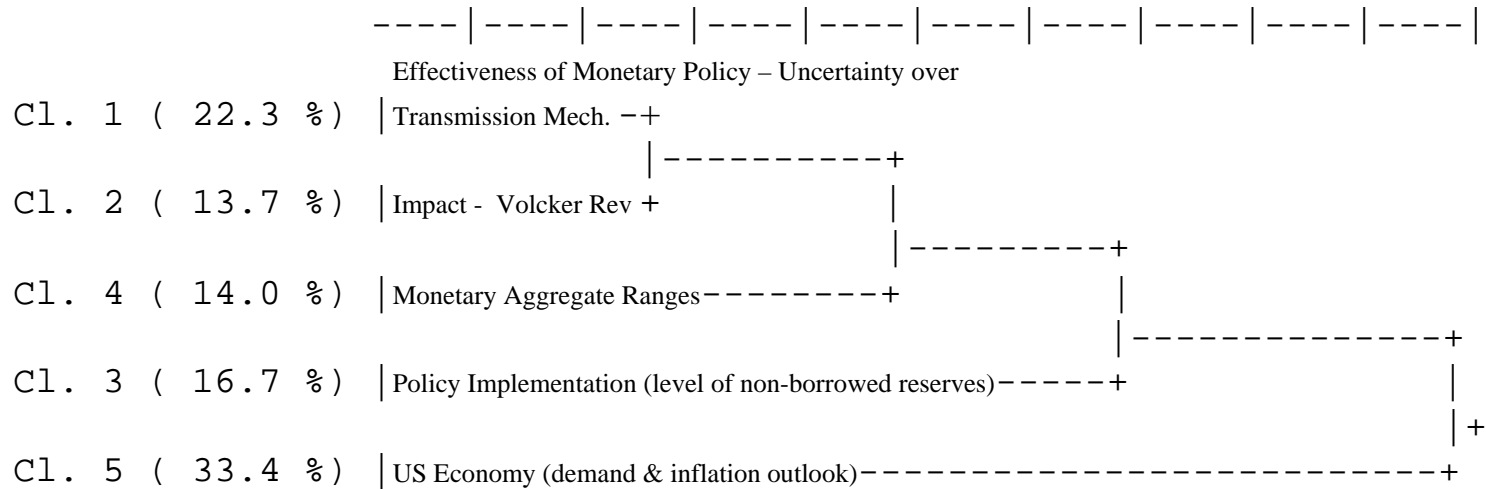


Fig. 3: Tree Graph of the Classes for the FOMC Transcripts, Volcker Era (1980)

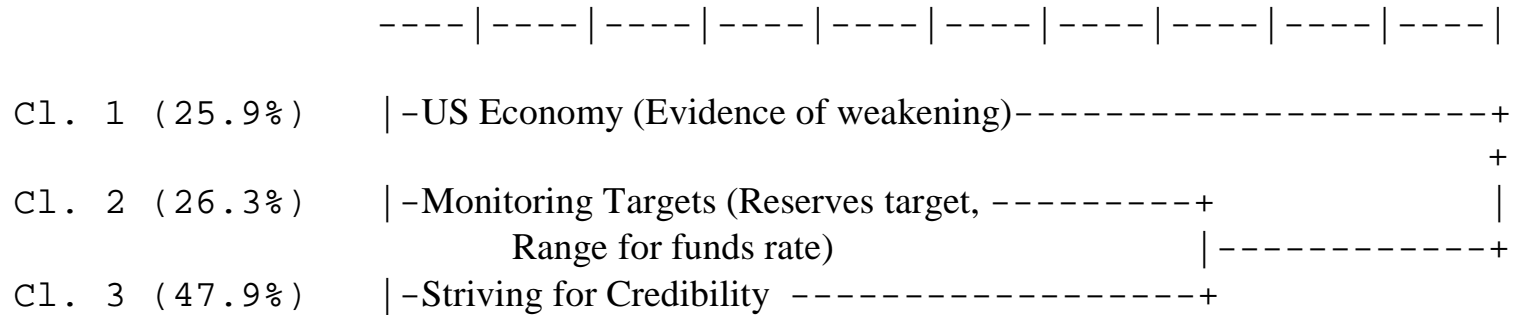


Fig. 4: Correspondence Analysis of Classes for FOMC transcripts, Miller Era (1979)

X (Factor 1): 31 % assn.
Y (Factor 2): 24 % assn.
(cumulative: 55 % assn.)

#1 = US Economy (stronger inflat.; weaker demand & output)

#2 = Uncertainty & Deliberation

#3 = Caution re: Changing Monetary Policy Stance

#4 = US Economy Demand & Output

#5 = Fed. Res. Financial Markets Operations

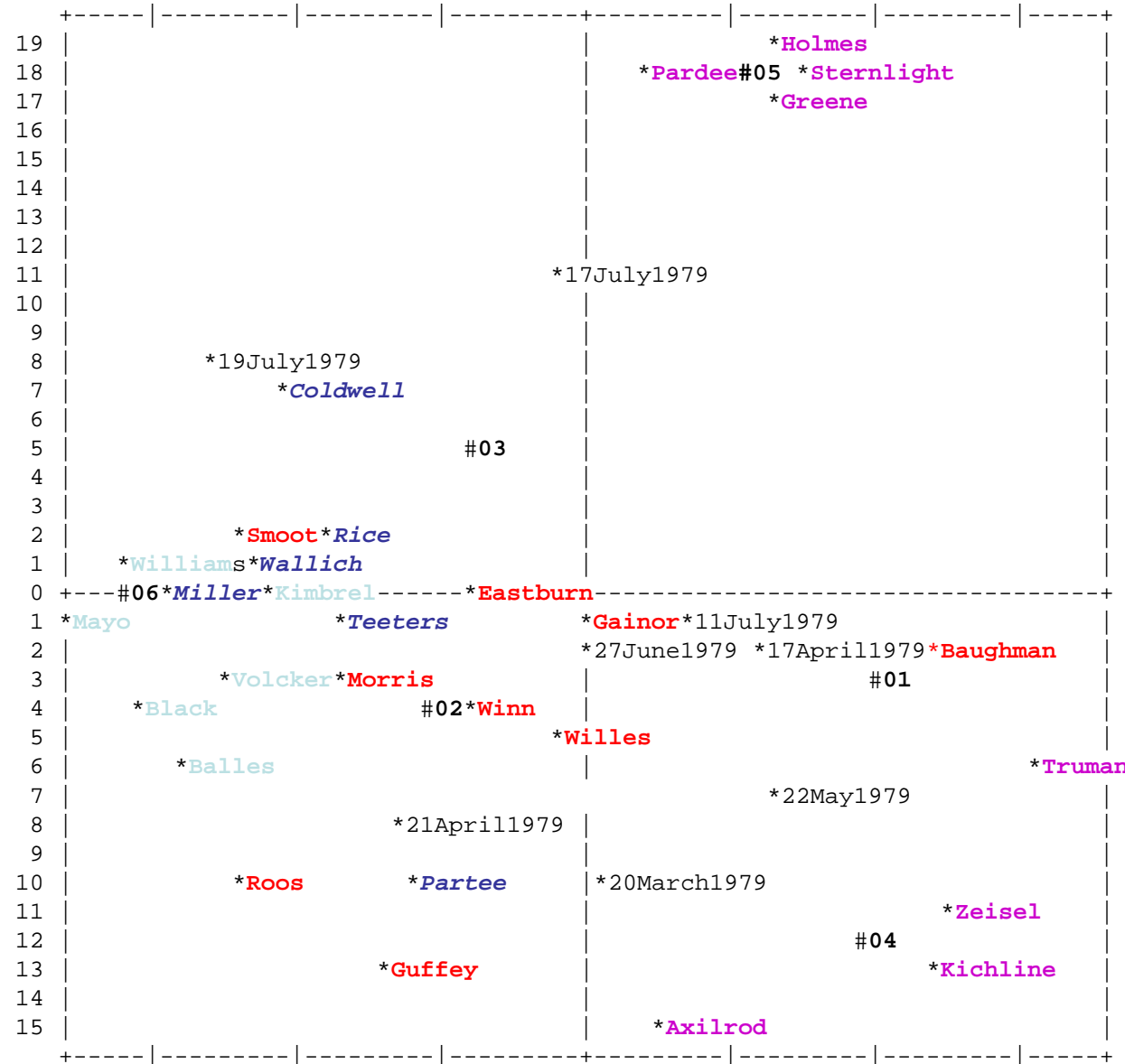
#6 = Target Ranges for Money & Int. Rates

GOVERNOR

BANK PRESIDENT

NON-VOTING PRESIDENT

STAFF



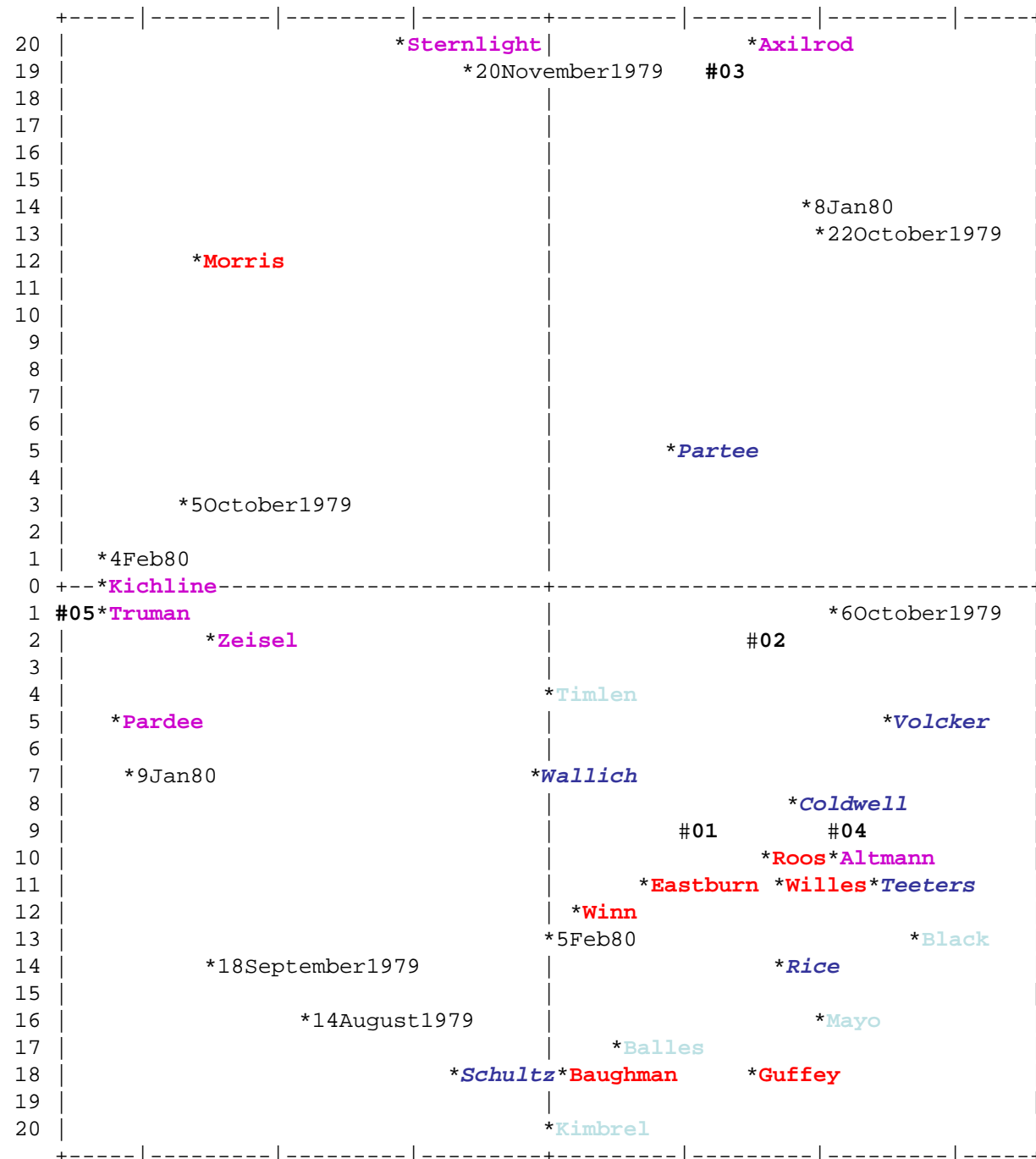


Fig. 5: Correspondence Analysis of Classes for FOMC transcripts, Volcker Era (1979)

X (Factor 1): 39 % assn.

Y (Factor 2): 27 % assn.

(cumulative: 66 % assn.)

#1 = Effectiveness of Monetary Policy – Uncertainty Over Transmission Mech.

#2 = Impact of Volcker Revolution on Int. Rates & Communication of the Policy Change

#3 = Policy Implementation (level of non-borrowed reserves)

#4 = Monetary Aggregate Ranges

#5 = US Economy (demand & inflation outlook)

GOVERNOR

BANK PRESIDENT

NON-VOTING PRESIDENT

STAFF



Fig. 6: Correspondence Analysis of Classes for FOMC transcripts, Volcker Era (1980)

X (Factor 1): 59 % assn.
Y (Factor 2): 41 % assn.
(cumulative: 100 % assn.)

#1 = US Economy (evidence of weakening)

#2 = Monitoring Targets (Reserves target, Range for funds rate)

#3 = Striving for Credibility

GOVERNOR

BANK PRESIDENT

NON-VOTING PRESIDENT

STAFF