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Even Keel and the Great Inflation

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Using IV-GMM techniques and real-time data, we estimate a forward looking, Taylor-type reaction function incorporating dummy variables for even-keel operations and a variable for foreign official pressures on the U.S. gold stock during the Great Inflation.We show that when the Federal Reserve undertook even-keel operations to assist U.S. Treasury security sales, the FOMC tended to delay monetary-policy adjustments and to inject small amounts of reserves into the banking system.The operations, however, did not contribute significantly to the Great Inflation, because they occurred during periods of both monetary ease and monetary tightness, at least in the FOMC's view.Consequently, the average federal funds rate during months containing even-keel events was no different than the average federal funds rate in other months, suggesting that even keel had no effect on the thrust of monetary policy.We also show that prospective gold losses had no effect on the FOMC's monetary-policy decisions in the 1960s and early 1970s.

Keywords: Even Keel, Taylor Rule, Federal Reserve, U.S. Treasury.

JEL classification: E5, N1, F3.

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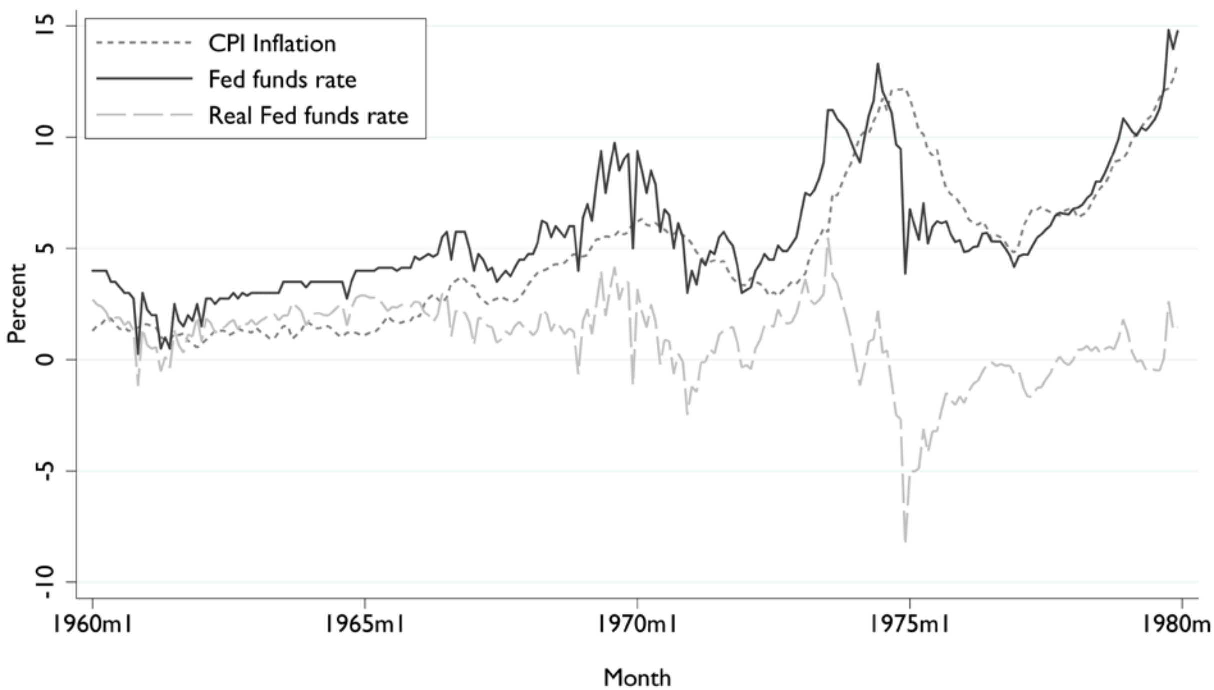
Even Keel and the Great Inflation

1. Introduction

The Great Inflation was one of the Federal Reserve's (Fed) biggest policy failures. Between 1965 and 1980, headline CPI inflation cycled upward from less than 2 percent to 14 percent with the each successive peak and trough exceeding the previous one. The cumulative price rise was on a par with previous war-time inflations, as De Long (1997, 248 – 249) shows. By 1976, worldwide confidence in the Fed's monetary policy was rapidly waning. Inflation and expectations of further inflation began to influence economic decisions in ways that threatened the nation's long-term growth and prosperity (Bordo and Orphanides 2013a, 2 – 6).

Figure 1: Inflation and the Federal Funds Rate: 1960 – 1979.



Note: Inflation calculated as year-over-year percentage change. *Ex post* federal funds rate equals the nominal federal funds rate less the year-over-year inflation rate.
Source: Haver Analytics

Economists have offered many explanations for the Great Inflation. Most find fault in an economic framework that downplayed money's causal role in the inflation process and emphasized instead such things as federal-budget deficits, union-wage demands, corporate pricing power, and myriad idiosyncratic relative-price shocks. Romer and Romer (2002), Nelson (2005), and Hetzel (2008), and Poole, Rasche, and Wheelock (2013) are noteworthy references.[1] Within this genre, many economists also stress that policy makers, with vivid memories of the

Great Depression, simply viewed unemployment has more socially disruptive than inflation (De Long 1997; Mayer 1999, 122 – 24; Hetzel 2008, 65, 67, 111). A belief in a permanently exploitable Phillips-curve tradeoff, especially before 1969, then leveraged this policy preference into higher inflation (Romer and Romer 2002). This tilt in policy became possible, as Bordo and Eichengreen (2013) explain, in large part because *ad hoc* policies to deal with U.S. balance-of-payments problems weakened the Bretton Woods constraint on U.S. monetary policy in the mid-1960s. Chari, Christiano and Eichenbaum (1998) and Christiano and Gust (2000) explain how the preference for real macroeconomic policy objectives and expectations subsequently interacted to heighten the costs of disinflationary policies, leaving policy makers all the more reluctant to adopt the latter. Others, notably Orphanides (2002, 2003), argue that persistent errors in the forecast of inflation and in the measurement of the natural rate of unemployment or the growth of potential output were key causes of the Great Inflation. Meltzer (2005, 2009a) also describes how personalities, politics, and institutional relationships influenced U.S. monetary policy and contributed to the Great inflation. Among these factors, Meltzer (2005, 153, 168) finds that the Federal Reserve's even-keel policy adversely influenced monetary policy and contributed to the Great Inflation. Romer (2005, 180), however, disagrees, but neither Meltzer nor Romer offers empirical support for their view.

In this paper, we attempt to quantify the effect of the Fed's even-keel operations on its monetary-policy outcomes between 1960:1 and 1979:9. If even-keel policies significantly contributed to the Great Inflation, they would—as a necessary condition—have to result in a monetary policy that was easier than otherwise would have been the case. To capture the counterfactual, we estimate a real-time, forward looking Taylor-type reaction functions under different assumptions about how the FOMC formed expectations. Dummy variables in the reaction functions test how even-keel events altered the FOMC's policy operations. Our parameter values—estimated using instrumental variables and generalized method of moments (IV-GMM)—indicate that even-keel operations did not contribute directly to the Great Inflation. They show that the FOMC undertook federal-funds-rate changes with deliberate inertia, whether or not even keel was in play, and that the Committee violated the Taylor principle by failing to raise its policy rate in real terms. We also show that the FOMC undertook even-keel operations both when tightening and easing policy—a process that would have lessened any net effect.

The remainder of this paper proceeds as follows: Section 2 describes even-keel operations from a historical perspective, explaining how and why they evolved from the Fed's debt-management operations during the Second World War. Section 3 describes our empirical methodology. This includes the derivation of our reaction functions, the construction of our even-keel variable, and the source of our real-time data. In this section, we also present our empirical estimates. Section 4 provides an economic interpretation of our empirical results as well as a comparison with the findings of key previous studies. Section 5 concludes with a restatement of the role of even-keel operations during the Great Inflation.

2. Background: World War II to Even Keel

The even-keel operations of the Great Inflation era were a vestige of the Fed's pre-accord debt-management policies. Although the 1951 accord reaffirmed the central bank's statutory authority for an independent monetary policy, the Fed continued to interpret its independence conditionally: The FOMC felt obligated to support other government policies provided that doing so did not undermine price stability. In the immediate post-war context, this meant that the Fed needed to support the Treasury's debt-management operations, since these stemmed from legitimate Congressional budgetary decisions. This interpretation of independence reflected not only political thinking within the Fed but a macroeconomic belief prevailing in the 1950s and 1960s, which held that monetary policy should generally support fiscal policy (Meltzer 2003, 581).

War Finance

During the Second World War, the Fed abdicated its responsibility for monetary policy, despite a concern for wartime inflation, and focused instead on helping the Treasury to finance the conflict.[2] Starting in March 1942, the FOMC pegged the Treasury bill rate at 0.375 percent and capped the yields on all other Treasury securities. Most importantly, the Fed limited the yield on long-term Treasury bonds to 2.5 percent. These actions produced a yield curve that was both relatively low and unusually steep. Doing so made credit available to the Treasury on favorable terms, encouraged immediate participation in bond drives by signaling that yields would not rise further, and protected investors from the possibility of subsequent capital losses (Walker 1954, 25, 29).

With the Fed effectively fixing the yield curve, long-term securities were virtually as liquid as short-term securities. By 1943, investors—notably banks—began shifting out of lower yielding short-term Treasuries bills and certificates and into the higher yielding long-term Treasury bonds. To maintain the peg on Treasury bill yields, the Fed acquired $13.3 billion, or 87 percent, of all Treasury bills issued between March 1942 and August 1945. The Fed also bought $7.5 billion worth of other short-term Treasury securities over the same period. Initially, the Fed bought a considerable amount of long-term Treasury bonds, but after 1942, private demand for these instruments remained so strong that the Fed actually reduced its holdings of long-term Treasuries.[3]

Altogether the Fed acquired $20.3 billion worth of Treasury securities during the war (Board of Governors 1976, Table 9.5A, 485). As with any open-market operation, these purchases injected reserves into the banking system, but unlike normal open-market operations, the Treasury could—and did—force reserve creation by issuing additional Treasury bills to the market. Private investors quickly sold these short-term securities to the Federal Reserve and bought higher yielding, liquid, long-term securities from the market. Wicker (1969, 453 – 454) explains that the Fed understood the mechanism. Walker (1954, 27) contends that the Treasury "made full and continuing use" of it. As a consequence, from 1943 through 1945, money growth exceeded real output growth by 9.7 percent, indicating that these operations offered a significant impetus to wartime inflation. With monetary actions aimed solely at debt-management goals, the Federal Reserve and the administration adopted credit restraints, wage-and-price controls, and rationing to contain inflation. When these ended in early 1946, inflation reached double-digit levels and would eventually peak at nearly 20 percent (year-over-year) in May 1947.

Toward the Accord

The Fed accepted its role in wartime finance, but as the war ended it sought more flexibility in its operations. At first, this only meant that the FOMC wanted the Treasury to set more realistic security prices and to allow short-term yields to rise somewhat (Chandler 1969, 498). Market rates on similar maturities had already begun to rise. The Treasury, concerned about refunding operations, initially resisted but eventually acquiesced, albeit in a disingenuous manner.

The Treasury endorsed the Fed's decision to stop pegging the yield on Treasury bills in early July 1947 and to end its ceiling on Treasury certificates a month later. The Treasury, however, maintained considerable leverage over the Federal Reserve, even in the bills market, because the Treasury set coupon rates on securities other than bills, which the Fed—consistent with its view of independence—felt compelled to maintain at, or above, par.[4] If the Fed failed to do so, the refunding operation might fail, and Congress or the administration might blame the Fed for the failure. Even operating too aggressively in the bills market could interfere with rates further out on the yield curve. Eventually, the Treasury consented to a series of increases in the bills rate, which reached 1 percent by early 1948, and loosened the yield caps on other instruments, except long-term Treasury bonds.

In the late 1940s, both the Fed and the Treasury thought that maintaining the 2.5 percent ceiling on long-term Treasuries was vital, even if doing so constrained monetary policy. Higher yields on long-term securities would raise the cost to the Treasury of its debt and could risk capital losses, which might damage the market for Treasuries. Moreover, because banks now held substantial amounts of long-term Treasury bonds, any capital losses might weaken the banking system (Eichengreen and Garber 1990, 28 – 33).

As short-term rates rose and the yield curve flattened, however, individuals and banks began to liquidate their holdings of long-term securities while the Treasury was still selling substantial amounts of them. Long-term yields began to rise, requiring the Federal Reserve to enforce the yield cap after October 1947. Over the next twelve months, the Fed added nearly $10.5 billion of long-term Treasury bonds to its portfolio but sold nearly an equal amount of short-term securities to offset the inflationary impact of the purchases (Board of Governors 1976, Table 9.5, 485). The Fed's ability to continue sterilizing long-term Treasury securities, however, was finite.

In 1949 and especially after the outbreak of the Korean War in June 1950, frictions dramatically increased between the Treasury's desire to minimize debt-serve costs and the Fed's growing inflation fears. The Treasury frequently set prices on new issues of securities too high relative to market prices and expectations, thereby forcing the Fed to support the sales. The Fed was running short of securities to sell as an offset; its balance sheet again started to expand, and inflation was rising quickly.

Tensions intensified. With Congress, which increasingly sided with the Fed, and the White House now looking on, the Treasury and the Federal Reserve reached an accord in March 1951 freeing the Fed from an obligation to peg interest rates.[5] By allowing flexibility in yields, the accord enhanced the effectiveness of monetary policy. Nevertheless, the Fed did not completely withdraw from Treasury debt operations.

Post-Accord Operations

To minimize bondholders' losses as long-term yields rose immediately following the accord, the Treasury substituted nonmarketable bonds yielding 2.75 percent for long-term marketable bonds then yielding 2.5 percent and soon offered to exchange these nonmarketable bonds for marketable 5-year bonds at 1.5 percent. The Fed facilitated the exchange by supporting the price of 5-year bonds up to a limit of $200 million, which it reached on the first day of the exchange (Hetzel and Leach 2001, 50 – 52).

After the accord, the Fed gradually allowed more variation in the yields on Treasury securities (Chandler 1969, 498; Friedman and Schwartz 1963, 625). The Fed neither sought the Treasury's permission to raise interest rates nor pegged specific security prices, but the Fed continued to support Treasury debt operations. For one thing, the Fed "initiated advice" to the Treasury on details about debt funding operations—notably coupon rates—until 1953 (*Historical Minutes* 4 -5 March 1953, 27). Doing so staked the Fed's reputation on the outcome of the funding operations. It is not surprising then that the FOMC, while not pegging specific Treasury prices, often acted to mitigate movements in Treasury security prices during funding operations (*Executive Committee* 5 April 1951, 4 - 5). The Fed also often purchased specific Treasury securities, although sometimes sterilizing the operations, at least in part, by selling other Treasury securities (*Annual Report* 1952, 106). "[I]t was not until December 1952, that a Treasury refunding operations was carried out without any support from the Federal Reserve" (*Historical Minutes* 3 March 1954, 49). Even after 1952, the Fed "steadied the market" during periods of Treasury financing.

The Fed also could offer less direct assistance to Treasury operations prior to 1953. The Manager of Federal Reserve Bank of New York's Desk, which maintained a more active view of "support" than the Board, had considerable leeway in how he executed the FOMC's directive for open-market operations. The manager could choose to buy or sell Treasury issues at any point over the yield curve. He could even undertake offsetting operations at different points on the yield curve under the FOMC's directive to "*maintain* orderly market conditions" [emphasis added].

Chairman Martin wanted to end this practice. He feared that it created uncertainty in the market about where the Fed was operating and distorted price signals (*Historical Minutes* 4 – 5 March 1953, 30 – 39). Moreover, it suggested that the Fed might still be setting yields on long-term Treasury securities, as it had prior to the accord. The Fed then might again find itself under pressure to fix Treasury bond yields (*Historical Minutes* 3 March 1954, 19). Martin, however, had only limited control over the Desk manager who was an employee of the Federal Reserve Bank of New York (Meltzer 2009, 40 – 42, 58 – 59). To overstep this problem, Martin proposed a controversial "bills only" policy, which the FOMC approved in March 1953. Under "bills only" the Desk would have to confine its open-market operations to the short-end of the Treasury market—preferably bills. Open-market operations then could only support monetary policy; they could not promote a specific pattern of Treasury yields.[6] Moreover, the bills market was broader than the markets for other maturities, so open-market operations in bills had less of a distortionary rate impact than operations in other, less-liquid markets (Young and Yager 1960). Absent Fed interference, Martin hoped that the Treasury bond market would mature and acquire greater "depth, breadth and resiliency" (Luckett 1960, 301)

Many observers did not like the bills-only approach and claimed that the Fed was foregoing a useful instrument (Friedman and Schwartz 1963, 634). They alleged that bills-only, which relies only on arbitrage to affect long-rates, sacrifices a direct effect that such open-market operations have on long-term interest rates, as explained in Riefler (1958). Moreover, they contended that long-term markets sometimes became disorderly and in these circumstances interventions in the long-term market should stabilize long-term yields. They argued that such actions supported underwriters of Treasury bonds, lowered risk premiums, and ultimately promoted investment (Meltzer 2009, 245).

The Fed deviated from bills-only in November 1955 and July 1958 to correct disorderly market conditions when large Treasury financing needs coincided with periods of heightened uncertainty about the outlook for interest rates (Young and Yager 1960, 350). In addition, between 1960 and 1965, the Fed, operating in conjunction with the Treasury, bought and sold securities along the yield curve to alter the overall maturity structure. This Operation Twist attempted to raise short rates to discourage capital outflows and to keep long rates low to encourage domestic investment (Bordo and Humpage 2014).

Even the bills-only policy did not mean that the Fed was abandoning all responsibility for Treasury debt-management operations. The Fed's contribution continued to evolve into a specific policy, known as even-keel, by 1955.[7]

Even Keel

Between 1955 and the middle of 1975, under its even-keel operations, the Fed froze policy changes and added reserves to avoid money-market disturbances from the time that the Treasury announced a security offering until private underwriters had an opportunity to place the paper. Markese (1971, 65, 82) suggested that even-keel operations could run anywhere from 12 to 30 days, but he estimated a mean of 22 days. Gustus (1969, 8) found a similar central tendency. The Fed steadfastly maintained that it did not attempt to peg, *ex ante*, a particular price for Treasury securities or otherwise create artificial market conditions during even-keel events; it just stabilized market-determined rates.

Even keel was necessary, as Meltzer (2005, 153) explains, because the Treasury did not auction its securities, other than Treasury bills. The Treasury announced coupon rates on its note and bond offerings and accepted bids until the issue was fully subscribed. Under such a procedure, an unanticipated increase in interest rates would impose a loss on buyers. This was especially crucial for the banks and security dealers who effectively acted as brokers and underwrote Treasury sales. Capital losses might curtail their future participations in Treasury sales, making it all the more difficult for the Treasury to raise low-cost funds.

The Fed did not extend even keel operations to the Treasury's regular auctions of bills (Markese 1971, 59 -60). Auctions freed the Treasury from having to guess the market clearing price for their securities prior to an issuance.[8] If they guessed wrong the issuance might fail. The Treasury worried, however, that auctioning longer-dated securities would drive small, unsophisticated investors from the market. As inflation and nominal interest rates increased in the late 1960s and early 1970s, interest-rate volatility also increased and raised the likelihood that a fixed-price offer would fail or be otherwise be mispriced (Garbade 2004, 34). In the 1970s, the Treasury began experimenting with auctions, working its way up the yield curve. "By mid-1973, auction sales of notes and bonds had replaced fixed-priced offerings" (Garbade 2004, 37). The Treasury, however, continued to refine the auctions operations.

By early 1973, some FOMC participants want a looser application of even keel. Holmes, echoing their sentiments, noted that the Treasury's increasing use security auctions allowed "even-keel constraints on open market operation [to] be relaxed" (*Memorandum of Discussion* 16 January 1973, 38). The Fed then began to ease out of even-keel operations, and we find no evidence of Fed even-keel operations after July 1975. Wallich (1979) seems to confirm our finding.

Even keel often involved two things: First, the Federal Reserve delayed overt changes in monetary-policy instruments (the discount rate, reserve requirements, or open-market operations) during the even-keel periods, unless—and this was pretty rare—such changes aided the Treasury's financing operations (Markese 1971, 73-77). Second, the Federal Reserve would typically add a small amount of reserves through open-market operations during the even-keel period. Adding reserves insured that underwriters had adequate liquidity to finance their purchases and avoided any temporary increases in money-market rates resulting directly from the Treasury's actions, since the sale itself would temporarily drain reserves (Markese 1971, 73-77; Meltzer 2005, 153-54). The Desk, however, was not to add reserves by buying the securities that the Treasury was selling or comparable securities (*Historical Minutes* 4-5 March 1953, 9). Gustus (1969, 6) claims that the aim of even keel was to keep net free reserves and the federal funds rate fluctuating in a narrow range. Yohe and Gasper (1970, 105) also suggest that preventing a rise in money market interest rates above their recent high was an particular operating goal.

All else constant, an occasional couple-of-weeks delay in the imposition of a monetary-policy adjustments and temporary small injections of reserves should not matter much for inflation or inflation expectations, but even-keel events occurred quite frequently during the Great Inflation. By our count, 41 percent of the 237 months between 1960:1 and 1979:9 involved at least one even-keel event; seven months included two even-keel events (see Table 1). Consequently, even-keel operations seem to have had the potential to contribute to the Great Inflation.

Table 1: Even-Keel Counts

	Month												
Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total Even Keels
1960		1		1				1	1	1	1		6
1961						1			1	1			3
1962	1	2		1							1		5
1963	1	2	1	2				1	1		1		9
1964	1	1		2	1	1	1	1		1	1		10
1965	1			1	1		1	1		2	1	1	9
1966	1	1		1	1			1		1	1		7
1967	1	1			1	1	1	1		1	1		8
1968					1		1			1	1		4
1969	1	1					1		1				4
1970	1	1		1	1			1		1			6
1971	1			1	1			1		1	1		6
1972	1			2		2	1			1		1	8
1973	1			1			1		1	1			5
1974		1	1	1			1			1			5
1975	1			1			1						3
Total	12	11	2	15	7	5	9	8	5	13	9	2	98

Note: Seven months contain two even-keel operations. There are 91 months containing one or more even-keel events.
Source: Board of Governors of the Federal Reserve System, *Annual Report*, 1960-75; Federal Open Market Committee *Minutes*, 1960-75

3. Empirical Methodology and Results

If even-keel operations did indeed contribute to the Great Inflation, then the process of delaying policy changes and injected reserves into the banking system must have resulted in a lower federal funds rate—an easier monetary policy—than otherwise would have been the case. To test this proposition, we estimate a forward-looking, Taylor-type reaction function for the Fed that incorporates real-time data and a dummy variable for even-keel events. We estimate this model using Hansen's (1982) instrumental-variables, generalized-method-of-moments (IV-GMM) technique at a monthly frequency from 1960:1 through 1979:9, dates that encompass Fed monetary policies leading to, and maintaining, the Great Inflation.

Our specification assumes that the federal funds rate is an adequate proxy for the FOMC's operating instrument and, therefore, measures the intended thrust of monetary policy over this time period. During the 1960s and the 1970s, the Committee famously relied on various reserve and monetary aggregates when formulating monetary policy, particularly over the longer term. The FOMC, however, never abandoned interest rates has a policy guide, particularly over the short run. As noted in Board of Governors (1974, 57-58):

> "Operating targets in recent years have included rates of growth in bank reserves and the monetary aggregates and associated ranges of tolerable changes in money market conditions. The key element in the later is a permissible range of fluctuation in the Federal funds rate."

The Board of Governors (1961, 211 – 212) contains an earlier, but similar, statement (see also Goodfriend 1991). The Federal funds rate was particularly important for gauging money-market conditions around even-keel periods.

Monetary Policy Reaction Function

Our model combines elements of both Clarida, et al. (2000) and Orphanides (2002, 2003). Accordingly, equation 1 specifies the federal-funds-rate target as:

$$(1) \qquad \bar{i}_t = \beta_0 + \beta_\pi (E_t \pi_{t+1} - \pi^*) + \beta_u (E_t u_{t+1} - u^*) + \varepsilon_t \,.$$

In equation 1, $\bar{i}_t$ is the FOMC's federal-funds-rate target, which the public cannot directly observe. π_t is the observed inflation rate in a given time period, *t*, and π^* is the inflation target. Similarly, u_t is the actual unemployment rate, and u^* is the target unemployment rate. E_t is the expectations operator. In equation 1, β_0 is an estimate of the FOMC's neutral rate of interest—in nominal terms—over our sample period. We expect β_π to be positive and β_u to be negative.

Conventional wisdom and strong empirical evidence indicate that the FOMC adjusts the federal funds rate (i_t), which is its operating instrument and is publicly observable, to its target value $(\bar{i}_t)$ with inertia (Goodfriend 1991; Clarida et al. 1998, 2000; Woodford 1999).[9] Equation 2 embodies this idea:

$$(2) \qquad i_t = \rho * i_{t-1} + (1-\rho)\bar{i}_t + \omega_t \,,$$

where $\rho \in [0,1)$. As suggested, if even-keel contributed to the Great Inflation, we would expect to find that the federal funds rate was systematically lower in even-keel months than the Taylor rule would otherwise predict. To investigate this, we incorporate a dummy variable for even-keel events, D_{ek}, in a combination of equations 1 and 2. We expect its coefficient β_{ek} to be negative. Our estimating equation is:

$$(3) \qquad i_t = \beta_{ek} D_{ek} + \rho * (i_{t-1}) + (1-\rho)\beta_0 + (1-\rho)\beta_\pi (E_t \pi_{t+1} - \pi^*) + (1-\rho)\beta_u (u_{t+1} - u^*) + \upsilon_t$$

where υ is the disturbance term, and $\upsilon_t \sim i.i.d.(0, \sigma_\upsilon^2)$.

As Orphanides (2001) shows, policy-reaction functions that are based on *ex post* revised data and that fail to incorporate expectations provide inaccurate descriptions of historical policy decisions. Monetary policy affects macroeconomic target variables with a lag, so policy makers must be forward looking in their policy formulations. Moreover, when setting policy, the FOMC does not know the current state of the economy with certainty—let alone its future state—but must depend on partial information about current variables and forecasts of future variables.

Therefore, one cannot adequately capture the policy makers' historical information set unless one uses real-time data—the information actually available to policy makers as they formulated policy—and forecasts.

We allow only a one-month-ahead forecast horizon in our model. A frequent criticism of the FOMC during the Great Inflation is that the committee had a very short-term focus. They responded to the most recent—often transitory—data and did not clearly relate this response to their long-term objectives (Meltzer 2005, 155 – 156). Indeed, between 1960 and 1968, the FOMC averaged 17 meetings per year, including telephone conference calls. This is approximately one meeting every three weeks. Between 1969 and 1979, the FOMC averaged 14 meetings per year, or once every 3¾ weeks.

Data Description

Whereas most studies of the Great Inflation employ quarterly data, our investigation of even keel necessarily requires observations at a higher frequency. We employ monthly real-time data in our model, which best captures the FOMC's decision-making process. We obtained real time data for the consumer price index and the unemployment rate from the Federal Reserve Bank of St. Louis' *ArchivaL of Federal Reserve Economic Data* (ALFRED). Revisions in the unemployment rate, unlike revision in actual or potential GDP, are relatively small, never exceeding 0.3 percentage points in absolute value. We measure inflation as the monthly percentage change in the headline consumer price index (CPI) multiplied by 12 to express it at annualized rate. The CPI data are not seasonally adjusted.[10] Revisions in the CPI can be substantial. Our federal funds rate (i_t) is the rate observed on the last day of a particular month.

Since we do not have *ex ante* measures of expected inflation ($E_t\,\pi_{t+1}$) and unemployment ($E_t\,u_{t+1}$), as in Orphanides (2002, 2004), we use three *ex post* proxies: 1) the current month's inflation and unemployment rates as the best guesses of the next month's rates; 2) the actual one-month-ahead inflation and unemployment rates as proxies for their expected values, and 3) averages composed of the inflation or unemployment rates in the past month, present month, and one-month ahead. We assume that the target inflation rate, π^*, is 2 percent, which, if anything, is high for the post-accord period prior to the Great Inflation. We set the unemployment-rate target at 4 percent, which is the natural rate of unemployment found in the *Economic Report of the President* over our estimation interval.

In constructing instruments for our IV-GMM procedures, we also use the Federal Reserve's industrial production index, net free reserves, and the Reuters-Commodity Research Bureau's spot commodity index. These series are not real time, but they do not directly affect decisions in our model.

We construct our even-keel dummy, D_{ek}, using meeting-to-meeting information on even-keel operations complied from the *Record of Policy Actions* found in the Board of Governor's *Annual Reports* (table 1). Since even-keel operations can span a few weeks, assigning some events to a specific month is problematic. Following Yohe and Gasper (1970), we attribute an even-keel announcement that occurred before the 21st of a month to the current month and those that fall on, or after that date to the subsequent month. This procedure seems appropriate given the mean duration of even-keel events—about three weeks—and because FOMC announcements of even-keel operations were usually forward looking:

> "…throughout this period [the roughly three weeks to the next FOMC meeting] the Treasury would be in the market with large and complex new cash and refinancing operation. This circumstance suggested the desirability of a steady money market."
>
> (6 June 1961 FOMC meeting, *Annual Report* for 1960.)

On average over our sample period, fewer than 20 percent of the FOMC meetings each year occurred on the 21st of the month or later.

Sometimes determining whether an even-keel operation took place from the narrative in the *Record of Policy Actions* is difficult; hence researchers' opinions can differ somewhat. When compared over the similar sample periods, our counts matched 90% of the counts in Yohe and Gasper (1970) and 88% of the counts in Markese (1971). In both comparisons, we count four fewer even-keel events than these researchers.

Stationarity of the Data

Most economic time-series contain a unit root, which can cause spurious regression results. Therefore, we test for non-stationarity in the federal funds rate (i_t), in the deviation of inflation from its target ($\pi_t - \pi^*$), and in the unemployment gap ($u_t - u^*$), using Augmented Dickey-Fuller (ADF) tests.[11] The null hypothesis of the ADF tests is that the individual series are non-stationary. We use the Schwarz Information Criterion to determine the appropriate lag lengths in the ADF tests. Table 2 summarizes our results:

Table 2: Adjusted Dickey-Fuller Tests

1960:1 - 1979:9	$\mathbf{i_t}$	$\mathbf{(\pi_t - \pi^*)}$	$\mathbf{(u_t - u^*)}$
ADF τ-statistic:	-0.055	-0.882	-1.361
p-value:	0.664	0.333	0.161
lag length:	3	4	4

We are unable to reject the null hypothesis for any of our variables, indicating that these variables are all non-stationary in levels.

Although these time-series are non-stationary in levels, they are cointegrated, as the three tests in Table 3 show. Consequently, we interpret the Taylor-type reaction functions that we present in the next section as representing a stable long-run relationship among these three variables.

Table 3: Cointegration Tests

i_t, (π_t - π*), (u_t-u*)

			JOHANSEN	TEST
1960:1 - 1979:9	**CRDW**	**E-G**	**Trace**	**Max-Eigenvalue**
test stat:	1.29	-7.00	68.01	14.71
p-value:	> 0.01	0.00	0.00	0.04
cointegrated:	Yes	Yes	Yes	Yes
cointegrating equations:	---	---	1	2

CRDW: Cointegrating Regression Durbin-Watson Test
E-G: Engle-Granger Test

Estimation Technique

As with most studies employing inertial Taylor rules, we estimate what is a dynamic process assuming that the inflation and unemployment variables are exogenous, and that the resulting error term is independently and identically distributed [$\upsilon_t \sim i.i.d.(0, \sigma_\upsilon^2)$]. Hansen's (1982) instrumental-variables, generalized method of moments (IV-GMM) lets us approximate these assumptions. Endogeneity—already problematic given the complicated and dynamic process model in our reaction function—is even more likely given the forward looking nature of equation (3). In a forward looking version of the Taylor rule, endogeneity can arise because the contemporaneous federal funds rate can affect the step-ahead inflation and unemployment variables. The IV-GMM weighting matrix can also account for heteroskedasticity and serial correlation of unknown form.[12] Consequently, IV-GMM yields consistent, asymptotically normally distributed parameter estimates with robust standard errors. We use 4 lags on inflation, unemployment, industrial production, commodity prices, net free reserves, and the even-keel variable as instruments.

Estimation Results

Table 4 summarizes the coefficient estimates for our reaction function, equation (3), with the robust standard errors in parenthesis:

Table 4: Taylor Rule Estimates

	Definition of forward looking:		
$E_t(X_{t+1})$ =	**X_t**	**X_{t+1}**	**$0.3(X_{t+1}+X_t+X_{t-1})$**
dependent variable:	**i_t**	**i_t**	**i_t**
β_{ek}	-0.096	-0.194	-0.260
	(0.274)	(0.230)	(0.231)
ρ	0.841	0.865	0.841
	(0.066)	(0.047)	(0.052)
$(1-\rho)\beta_0$	0.824	0.737	0.906
	(0.356)	(0.258)	(0.306)
$(1-\rho)\beta_\pi$	0.110	0.086	0.099
	(0.047)	(0.031)	(0.035)
$(1-\rho)B_u$	-0.103	-0.079	-0.107
	(0.048)	(0.036)	(0.044)
R^2	0.886	0.879	0.884
Adj. R^2	0.884	0.877	0.882
S.E.	0.890	0.916	0.897
J-stat	16.571	17.076	17.848
Prob(J-stat)	0.414	0.648	0.597

Note: Models estimated using IV-GMM. Instruments include four lags on inflation and the unemployment rate, the percentage change in industrial production and commodity prices, changes in net free reserves, and the even-keel dummy. The X's in the definitions of forward looking refer to the inflation or unemployment gaps.

We estimate the model from 1960:1 to 1979:9 but lose four observations to lags, leaving 233 observations in each case. The first column lists the variables in our model. The next three columns report the estimated coefficients with robust standard errors in parentheses for each model. In second column, the model treats this month's values for inflation and unemployment as the best guess of next month's values. In the third column, the model assumes that next month's inflation and unemployment rates are today's expected values. In the fourth column, we specify the expected values of next month's inflation and unemployment rates as the average of last month's, this month's, and next month's actual values.

All variables have the expected sign, and all are statistically significant with a p-value no greater than 5%, except β_{ek}, the coefficient on the even-keel dummy. The R^2's for the models are all approximately 0.88. We test the validity of the instruments using Hansen's test of the over-identifying restrictions. The null hypothesis of that test is that the instruments used in the IV-

GMM estimation not correlated with the error term. Our estimated Hansen *J* statistics have high p-values (0.60 to 0.65) indicating that we cannot reject the H_0 in any case and giving us greater confidence that the instrument set is appropriate.

Table 5 reports the coefficient and standard-error estimates for β_{ek}, and ρ from table 4 and presents additional coefficient and standard-error calculations for β_0, β_π, and β_u. These calculations are based on the estimates in table 4. All coefficient estimates are highly significant. We use table 5 to interpret our econometric results.

Table 5: Key Taylor-Rule Coefficients

	Definition of forward looking:		
$E_t(X_{t+1})$ =	**X_t**	**X_{t+1}**	**$0.3(X_{t+1}+X_t+X_{t-1})$**
dependent variable:	**i_t**	**i_t**	**i_t**
β_{ek}	-0.096	-0.194	-0.260
	(0.274)	(0.230)	(0.231)
ρ	0.841	0.865	0.841
	(0.066)	(0.047)	(0.052)
β_0	5.179	5.473	5.706
	(0.623)	(0.277)	(0.403)
β_π	0.692	0.636	0.624
	(0.073)	(0.069)	(0.081)
β_u	-0.648	-0.584	-0.674
	(0.133)	(0.170)	(0.152)

Note: The numbers in parentheses are robust standard errors. The X's in the definitions of forward looking refer to the inflation or unemployment gaps.

4. Economic Interpretation

Under even-keel practices, the FOMC stabilized interest rates by delaying policy changes and injecting a small amount of additional reserves into the banking system. If these operations contributed to the Great Inflation, we would expect to find that the federal funds rate—the FOMC's policy instrument—was lower on average during the 91 months containing even-keel events than the estimated Taylor rule would otherwise have predicted. While our estimated coefficients ($\beta_{ek)}$ are universally negative in table 4, they are far from being statistically significant in all cases. We, therefore, cannot reject the null hypothesis, $\beta_{ek} = 0$, and conclude that even-keel operations did not contribute the Great Inflation. Overall, the FOMC acted no differently during months containing even-keel events than in other months.

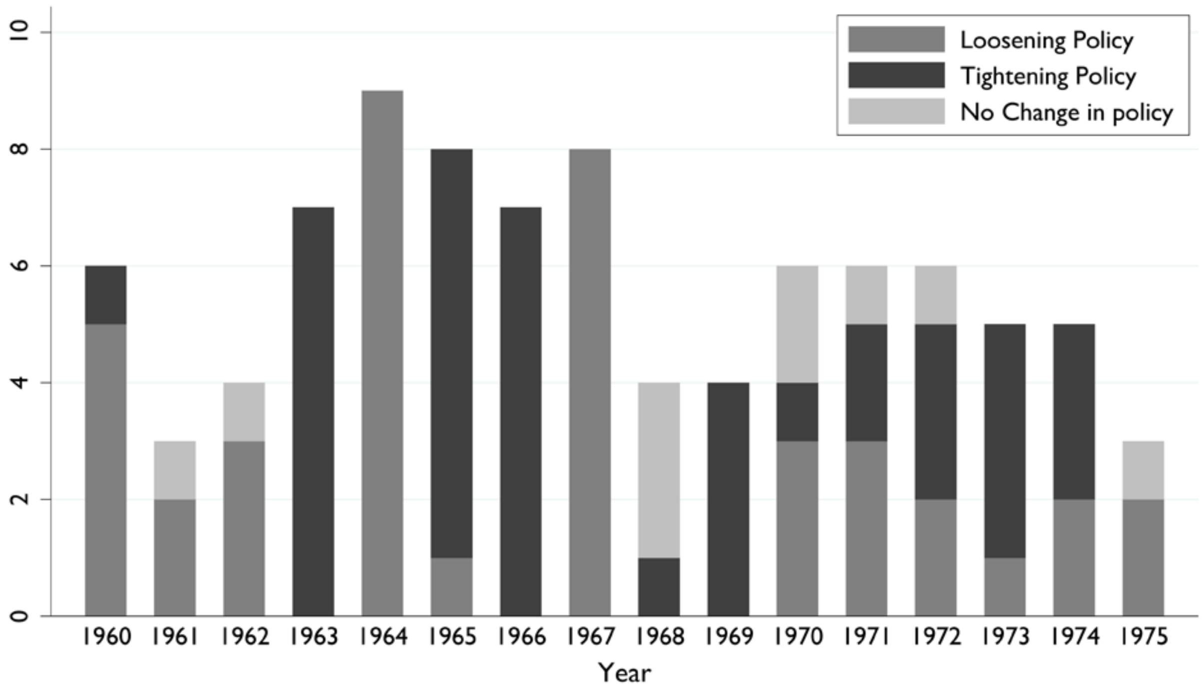
Two factors help explain our result. First, while on balance even-keel operations tended to delay FOMC decisions to tighten monetary policy, they often also delayed monetary-policy actions to ease during the Great Inflation. In June 1961, for example, the FOMC undertook an even-keel operation, delaying any further monetary ease during a period in which the Committee generally sought to encourage an expansion of credit:

> "In view of impending U.S. Treasury financing,…the Committee concluded that in the period until the next meeting it would be desirable to maintain approximately the *same degree of ease* as had prevailed recently…."
>
> (*Annual Report* 1962, p. 61, emphasis added).

Figure 2 (below) casts all of the even-keel-event months between 1960 and 1975 against the FOMC's designs for monetary policy. The figure contains instances when even-keel operations were associated with monetary ease, monetary tightness, or no change in policy. In 1971, for example, the FOMC engaged in even-keel operations during six months, presumably delaying any overt changes in policy. Of these six, three were associated with an overall easing according to FOMC statements. Two even-keel months corresponded with a tightening of policy, and one was associated with no change. In 1964 and 1967, all even-keel events were associated with actions that the FOMC described as easing monetary ease. In 1963 and 1966, on the other hand, all even keel events corresponded to actions that the FOMC saw as tightening monetary conditions. Of the 91 even-keel months between 1960:1 and 1975:9, 31 percent (28) occurred in months during which the federal funds rate (i_t) decreased, and, similarly, 47 percent (43) occurred in months when the estimated federal-funds-target rate ($\overline{i_t}$) fell.[13] (As explained below, the reaction functions gave little weight to the inflation gap.) Figure 3 illustrates how even keel events corresponded to increases and decreases in the federal funds rate more broadly. It shows that operations—implying policy delays—occurred both when the federal funds rate was rising and falling. Because even-keel operations delayed both types of policy moves, it seems plausible that the operations could have had no discernable net effect.

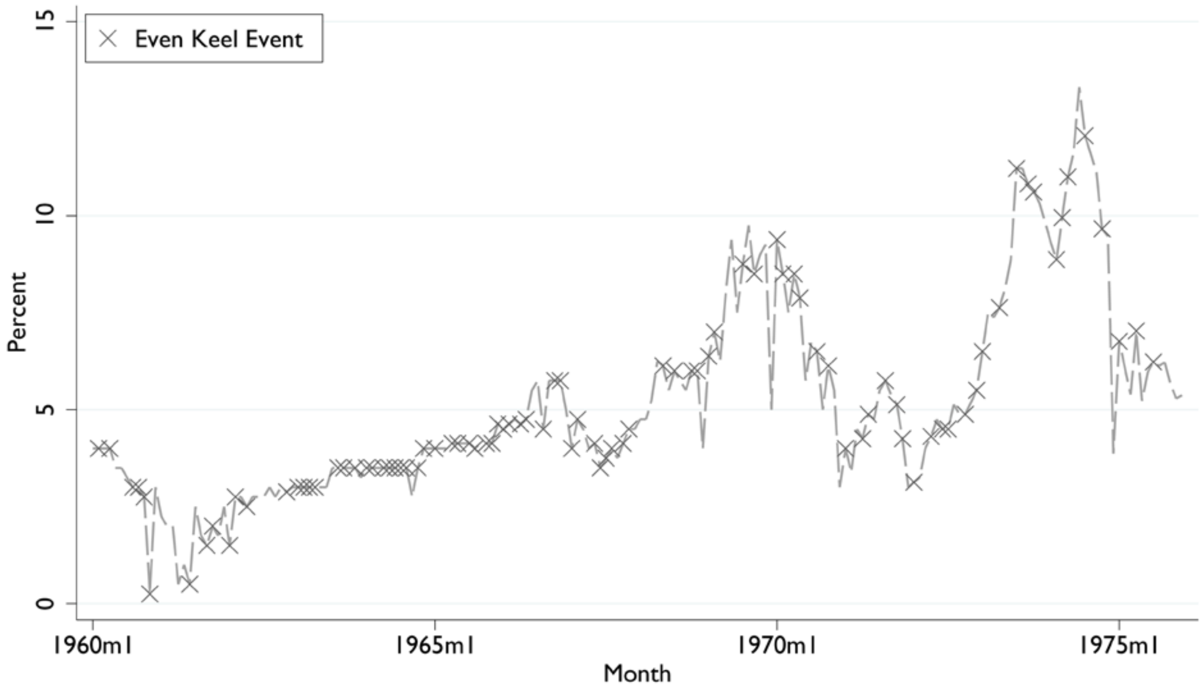
Figure 3: Even-Keel Events by Policy Environment

Events per year



Note: The data show the number of even-keel evens per year, corresponding to the thrust of policy as indicated by FOMC comments in the Annual Reports.
Source: Board of Governors Annual Reports 1961 – 1976.

Figure 3: Federal Funds Rate and Even-Keel Events



Note: The federal funds rate is for the last day in each month.
Source: Haver Analytics; Board of Governors of the Federal Reserve System, *Annual Report*, 1960-75; Federal Open Market Committee *Minutes*, 1960-75

A second explanation for finding no effect from even keel appears in our estimates of the inertia coefficients, the ρ's. These coefficients are extremely high—averaging nearly 0.85 across the three models—and indicate that the FOMC was generally slow to adjust the policy instrument, even in the absence even-keel events. The estimates imply that the FOMC took over a year to fully incorporate a desired change in federal-funds-rate target, $\bar{i}_t$, into the actual observed rate, i_t. When we adjust the inertia coefficient to a quarterly basis ($0.85^3 = 0.61$), our estimates are similar to those found in Clarida et al.'s (2000, 160) quarterly model for the pre-Volcker era (1960:Q1 through 1979:Q2). In the version of their model using the CPI as a measure of inflation, their ρ is 0.65 (s.e. = 0.05), and in the version of their model using the unemployment rate as a measure of slack, their ρ is 0.60 (s.e. = 0.11). Likewise, our estimates of the inertia parameters are similar to those found in the quarterly model that Orphanides (2002, 118) estimates from 1969:Q1 through 1979:Q2. His ρ estimate is 0.59 (s.e. = 0.05). In Orphanides (2004, 161) the estimated ρ values in various specifications of his Taylor rule for the 1969:Q1 through 1979:Q2 period range from 0.66 (s.e.= 0.08) to 0.71 (s.e.= 0.10).[14] In a world such as these inertia estimates portray, the Fed's even-keel policies might never stand out as a significant deviation from the FOMC'S norm.[15]

Our estimates of β_0, the nominal neutral rate of interest averages 5½ percent across our three estimates in table 5. If we assume an underlying real neutral rate of 2 percent, this estimate suggests that the FOMC was willing to accept an inflation rate that was 1½ percent above our presumed 2 percent inflation target in an effort to secure the full-employment part of its dual mandate. That is, the steady state acceptable rate of inflation over this period was about 3½ percent.

Our estimates of β_π indicate that during the Great Inflation, the FOMC did not follow the Taylor principle; that is, the committee did not attempt to raise real interest rates in the face of inflation. Our β_π estimates average 0.65 across the three models in table 4. The Taylor principle requires that $\beta_\pi > 1$. Clarida et al (2000) also find that the FOMC violated the Taylor principle in the pre-Volcker era. Using quarterly CPI data (1960:Q1 to 1979:Q2), Clarida et al. (2000, 160) estimated a β_π coefficient of 0.68 (s.e. = 0.06), which is nearly identical to ours.

In contrast, Orphandise (2002, 2004) suggests that the FOMC conformed to the Taylor principal during the 1970s. Using real time data in a forward looking equation with partial adjustment, Ophanides (2002) estimates a $\beta_\pi = 1.52$ (s.e. = 0.24). Ophanides (2004, table 1) estimates β_π in a range of 1.48 (s.e. = 0.38) to 1.59 (s.e. = 0.43) for the 1966:Q1 through 1979:Q2 period. Notice, however, that values below one fall within two standard errors of Orphanides' (2004) point estimates.

Our estimates of the coefficients on the unemployment gap, β_u, average -0.64 across our three models in table 5 and range from -0.67 to -0.58. These estimates are again similar to the 0.60 (s.e. = 0.11) found for β_u in Clarida et al.'s (2000, 160) model containing the unemployment rate as a measure of the business cycle. Our negative coefficient indicates that the FOMC took appropriate actions that lowered the federal funds rates when the actual unemployment rate rose above 4 percent, the then-prevalent estimate of the natural rate of unemployment. When we adjust our coefficients to an output-gap equivalent using a simple version of Okun's law, the implied coefficient is -0.23, which is similar to the pre-Volcker output gap measures found in Clarida et al. (2000).[16] Our unadjusted β_u estimate (Table 5), however, is well below the β_u = 2.04 (s.e.= 0.30) in Orphanides (2002), which comes from on an employment gap, but when we adjusted our value of β_u to an output gap with Okun's law, the estimate is slightly lower than the estimates found in Ophanides (2004, table 1). Over the period 1966:Q1 to 1979:Q2, Ophanides' estimates range from 0.46 (s.e. = 0.13) to 0.57 (s.e. = 0.26).[17] Our Okun's-Law-adjusted estimates fall within one standard error of Orphanides' point estimates.

The general similarity between our estimates of ρ, β_0, β_π, β_u, and those found in Carida et al (2000) and Ophanides (2002, 2004) increase our confidence in our estimation results. In particular, they give us greater confidence in our conclusion that β_{ek} is not statistically different from zero is correct.

5. Conclusion: Why Even Keel Did Not Contribute to the Great Inflation

During the Great Inflation, the Fed frequently delayed policy changes and injected a small amount of reserves into the banking system to assist the U.S. Treasury's debt-financing operations. By keeping money-market yields from rising for roughly three weeks after the Treasury announced an offering, the Fed attempted to prevent underwriters from taking capital losses on their positions. Capital losses could drive banks and securities dealers from the market, which would then push up the costs of financing the nation's debt.

Many have claimed that these even-keel procedures—a vestige of the Fed's pre-Accord debt-management operations and the FOMC's conditional view of its independence—contributed to the Great Inflation by compromising the Fed's ability to quickly tighten monetary policy in respond to the rising inflation rates of the era. We, however, find no empirical evidence to support this claim. Our Taylor-rule estimates, across various specifications, indicate that the federal-funds rate was not significantly different in even-keel months than the model would have otherwise suggested. Hence, even-keel operations did not hold interest rates lower than they otherwise would have been—a necessary condition for even-keel operations to contribute to inflation.

Two factors help explain our results: First, even-keel operations delayed monetary-policy actions both to ease and tighten credit conditions. Any net impact may simply have been washed out over the entire sample period. To be sure, as our estimates suggest, the FOMC's actions to tighten monetary policy were universally too little and too late during the Great Inflation. Still because even-keel operations did not discriminate as to the thrust of monetary policy, they had no discernable net effect. Second, as we show, the FOMC adjusted the federal funds rates very slowly to deviations in the inflation and unemployment rates from their target levels. They did so, whether or not even-keel events were underway, to avoid sharp changes in money-market rates. In this policy environment, even-keel operations did not represent a discernable deviation from this general mode of operation.

Although even-keel operations do not seem to have *directly* contributed to the Great Inflation, they may have done so *indirectly* by undermining of the FOMC's credibility. As these even-keel operations show, the System interpreted its monetary-policy independence conditionally after the accord. Concern that the FOMC might delay a needed monetary response, whether to assist Treasury debt operations or out of concern for an unemployment objective, may have affected inflation expectations along the lines suggested in Chari, Christiano and Eichenbaum (1998) or Christiano and Gust (2000). To be sure, we do not have direct evidence for this conjecture, but the same issue reappeared in the late 1980s and early 1990s. Then the FOMC explicitly rejected participating in Treasury-directed, foreign-exchange operations because they undermined monetary-policy credibility, as detailed in Bordo, Humpage and Schwartz (2015). Central-bank independence and monetary-policy credibility are nuanced concepts. While we cannot measure the indirect contribution of even keel to the Great Inflation, we know that the Fed lost monetary-policy credibility during the era and that even-keel certainly did not help matters.

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Endnotes

[1] For a survey of recent thought, see the Bordo and Orphanides (2013) conference volume.

[2] The Fed's actions during the war were not unprecedented. During World War I the Fed eased monetary policy in order to keep Treasury borrowing costs low. The Fed also abandoned its penalty discount rate and offered preferential rates directed at facilitating Treasury debt finance (Meltzer 2003, 84 – 90). Chandler (1949) and Eichengreen and Garber (1990) also find some ad hoc antecedents just prior to World War II: The Fed attempted to influence the yield curve by buying long-term Treasuries in 1935, between 1937 and 1939, and in late 1939 and 1940 as war approached.

[3] Data on the Fed's acquisition of Treasury securities are from Board of Governors 1976, Tables 9.5A, 9.5B, and 13.2.

[4] The Fed often advised the Treasury on pricing its securities.

[5] For detailed and interesting accounts of the events building to the accord see Hetzel and Leach (2001), Meltzer (2003, ch.7) and Moe (2013).

[6] Among the changes associated with "bills only," the FOMC altered the directive to the Desk from "maintaining orderly markets" to "correcting disorderly market conditions," which confined operations to "unusual circumstances," and not to moderating Treasury price fluctuations (Annual Report 1954, 7).

[7] Federal Reserve Bank of New York President Allan Sproul seems to have first used the term "even keel" in 1955: "…for the immediate future, open market operations, if they become necessary, should be used ….to maintain an even keel for Treasury financing" (*Executive Committee* 26 April 1955, 14). Thereafter, however, FOMC participants sometimes used the term "even keel" to refer to holding policy steady irrespective of any Treasury debt operation.

[8] Garbade (2004) provides an excellent explanations of the Treasury's adoptions of securities auctions.

[9] In contrast Rudebusch (2002) argues that a large and significant coefficient on the lagged interest rate reflects serially correlated variables that are incorrectly omitted from the reaction function. Studies, such as Castelnuovo (2003), English et al. (2002), Gerlach-Kristen (2004), that investigate the relative importance of policy inertia and omitted variables conclude that both mechanisms are at play. Our empirical methodology adjusts for serial correlation.

[10] Only non-seasonally adjusted real time data are available in AlFRED. Applying our own seasonal adjustment to these data did not materially affect our results.

[11] On the issue of stationarity of variables in Taylor rules, see Österholm (2005).

[12] We estimated the model in *Eviews* using the Newey-West process for estimating the weighting matrix and allowing the model to iterate to convergence.

[13] Calculated using the coefficient averages in table 5 as: $\overline{i_t} = 0.5 + 0.7(\pi_t - \pi^*) - 0.6(u_t - u^*)$.

[14] The specifications differ in terms of the forecast horizon for π and u.

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[15] Both Clarida et al. (2000) and Orphanides (2004) allow for an additional lag on the federal fund rate and, hence, estimate a ρ_{t-2}.

[16] Okun (1962) estimates: $U_t = 3.72 + 0.36\ (Y^* - Y_t)$ where U is the unemployment rate, Y is output and Y* is potential output. We adjust our estimate to an output gap, using $(U_t – 4) = -0.4\ (Y_t - Y^*)$.

[17] Orphanides specifies his output gaps as the reverse of ours; hence he estimates positive coefficients.