

June 16, 2000

**An Examination of the Asymmetric Effects of Money Supply Shocks in the
Pre-World War I and Interwar Periods**

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We thank Georgios Karras for generously providing his RATS code.

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Abstract

Building upon the work of Cover (1992), a sizeable literature has developed in which the asymmetry of money supply shocks has been empirically investigated. The bulk of this work has focused on post-World War II data. Accordingly, we study this question with U.S. data from both the interwar period and a near 40-year pre-World War I period. We find strong evidence in favor of monetary shock asymmetry only for the latter stage of the Great Depression, and speculate that the appearance of this asymmetry was due to the rather unique institutional and financial circumstances that prevailed at the time.

1. Introduction

Cover (1992) emphasizes that the empirical New Classical literature on the effects of monetary policy shocks makes no distinction between positive and negative shocks; see, e.g., Barro (1977, 1978) and Mishkin (1982). If such a distinction is important, then the traditional approach to testing the neutrality of unanticipated movements in money is misspecified and masks state-dependent dynamics which may have important consequences for both monetary policy and theory. Using quarterly post-World War II (WWII) data for the U.S. economy, Cover (1992) concludes that negative money supply shocks have a significantly larger effect on output than do positive shocks. He shows that these results are robust to exclusion of post-October 1979 data (to account for the subsequent shift in monetary policy regime) and to a number of alternative specifications of both the output and money growth equations used in his econometric framework.

Cover (1992) motivates his empirical search for monetary shock asymmetry on the basis of what Ravn and Sola (1999) call “traditional Keynesian asymmetry,” a claim that the aggregate supply curve is convex or, in its extreme version, “backward L-shaped.” Though weak on microfoundations, such behavior can be generated under the assumption of decreasing sticky and increasing flexible nominal wages or prices.

The relative strength of negative money supply shocks that Cover (1992) documents is also consistent with Ball and Mankiw’s (1994) dynamic menu-cost model in the presence of trend inflation. Monetary policy shock asymmetry arises in this model as follows, under the assumption that firms can change prices subject to incurring a menu cost. All else equal, a positive money supply shock leads to an increase in a representative firm’s desired relative price and a negative money supply shock leads to the opposite. With trend inflation a negative shock is likely to lead the firm to keep its nominal price unchanged and not pay the menu cost, since inflation induces an automatic decrease in its relative price. However, since the firm’s optimal desired relative price increases in the presence of a positive shock, and the presence of trend inflation leads to a decrease in its actual relative price *ceteris paribus*, the firm is more likely to pay the menu cost and increase its nominal price in response to a positive money supply shock. With trend inflation, then, the Ball and Mankiw (1994) model implies larger adjustments in output in response to negative money supply shocks

than to positive money supply shocks.

The empirical investigation of the relative effects on output of positive and negative monetary shocks can thus be motivated with appeal to both traditional Keynesian asymmetry and New Keynesian dynamic menu-cost asymmetry of the Ball and Mankiw (1994) type. Another class of monetary policy asymmetry arises from the possibility that money affects aggregate economic activity differently across the business cycle. Such asymmetry can stem from credit market imperfections; see, e.g., Bernanke and Gertler (1990). This type asymmetry, however, is distinct from that considered in this paper.

Using a variety of econometric techniques, several authors report results that are consistent with Cover's (1992) findings. Examining annual U.S. data from the post-WWII, pre-WWII, and pre-Depression periods, DeLong and Summers (1988) find that positive money supply shocks have weaker effects than do negative money supply shocks in each of the sample periods they study. Their two-step OLS procedure, however, makes use of generated regressors, calling into question the hypothesis testing they carry out; see Pagan (1984). Modeling inflation as a Markov-switching process, Rhee and Rich (1995) show that negative money supply shocks have a larger impact on quarterly U.S. output in the 1960-1990 period than do positive money supply shocks. Their analysis also suggests that these asymmetric effects are magnified by increases in absolute inflation. In a pair of papers Karras (1996a, 1996b) studies annual post-WWII data from panels of countries and finds strong evidence in favor of monetary shock asymmetry in many cases. Using information in the yield curve to measure the stance of monetary policy, Macklem, Paquet, and Phaneuf (1996) show that such asymmetries in post-WWII Canadian and U.S. quarterly data are robust to controlling for foreign factors. Demery and Duck (2000) test a variant of the Ball and Mankiw (1994) model modified to allow for long-term growth and some elementary dynamics on quarterly post-WWII U.K. data and find that nominal demand shocks have nonlinear and asymmetric effects on output in the presence of trend inflation.

Not all results in the empirical literature support Cover's (1992) findings, however. Evans (1986) argues that the evidence in favor of monetary shock asymmetry is weak, since his analysis of the distributional

properties of output and the price level, fitted reduced forms, and estimated structural equations for both interwar and post-WWII annual data suggests that the effectiveness of monetary policy does not depend on capacity utilization. Further, Ravn and Sola (1996) argue that Cover's (1992) results may be driven by the presence of a large outlier in money growth in the first quarter of 1983. When they introduce a dummy variable in the output equation of Cover's model to account for this outlier, they are unable to reject the monetary shock symmetry null hypothesis at conventional significance levels. Also, Belongia (1996) shows that if a divisia index is used as the money supply measure, the symmetry null once again is not rejected over the sample period used by Cover (1992).

While empirical examination of money supply shock asymmetry has clearly received a lot of attention, we note that with the exception of DeLong and Summers (1988) and Evans (1986), all of the evidence in the literature to date is restricted to the post-WWII era. This is a major point of departure for our paper, in that we explore this issue with U.S. data from two important earlier historical periods, the interwar and pre-World War I (WWI) periods.

We feel that investigation of this question is important for at least two reasons. First, the findings of DeLong and Summers (1988) and Evans (1986) strongly conflict with one another, so that no consensus exists on the presence of monetary shock asymmetry in the pre-WWII period. Especially since we make use of higher frequency data than that used by these authors, our analysis can help provide a step towards resolving this matter. In doing so our study allows us to establish whether there exists a possible historical precedent for the asymmetric effects of money supply shocks that appear to be evident in the post-WWII era. Second, both the interwar and pre-WWI eras were periods of significant deflationary spirals; see Figures 1 and 2 for time series plots of the U.S. wholesale price index for these two periods. This gives us the opportunity to test the Ball and Mankiw (1994) model in the presence of trend deflation, a situation in which we would expect positive shocks to have stronger effects on real output than negative shocks, i.e., a state in which the model's implications under trend inflation are reversed. While the Ball and Mankiw (1994) model

was developed with the post-WWII phenomenon of trend inflation in mind, we feel it is important to examine whether the theory is compatible with other important periods of business cycle fluctuations. Here we appeal to Bernanke and Carey's (1996) concern that macroeconomic theories be consistent with both post-WWII and pre-WWII aggregate behavior.

The paper proceeds as follows. In Section 2 we describe the data used and the econometric approach employed. We present our empirical results in Section 3 and in Section 4 we offer some explanations for the documented appearance of monetary shock asymmetry once the U.S. economy passed the trough of the Great Depression. Section 5 concludes.

2. Data and Econometric Methodology

For the pre-WWI period we use quarterly data from Gordon (1986). The sample period is 1875:1-1914:2 and we use the following series: output, y_t , is defined as the growth rate of real GNP; m_t is the growth rate of the M2 money supply; i_t is the commercial paper rate; and p_t is the inflation rate as measured by the growth rate of the wholesale price index. With the exception of the commercial paper rate, each series is seasonally adjusted. For the interwar period we use monthly data collected from various sources. The sample period is 1920:01-1941:12 and the data are all seasonally adjusted at the source except as noted. We use the following series for the interwar period: output, y_t , is defined as the growth rate of industrial production (*Federal Reserve Bulletin*); m_t is the growth rate of the M1 money supply (Friedman and Schwartz (1963)); i_t is the commercial paper rate (not seasonally adjusted, *Banking and Monetary Statistics*); and p_t is the inflation rate as measured by the growth rate of the wholesale price index (*Federal Reserve Bulletin*).

The empirical methodology we employ is very similar to that used by Cover (1992). The econometric model comprises a system of two equations, one for the money supply and one for real output, and a pair of identities for constructing the positive and negative money supply shocks. The money supply process is

modeled as in equation (1):

$$m_t = \alpha_0 + \sum_{j=1}^q \alpha_j^m m_{t-j} + \sum_{j=1}^q \alpha_j^y y_{t-j} + \sum_{j=1}^q \alpha_j^p p_{t-j} + u_t, \quad (1)$$

where u_t is the money supply shock. This specification differs somewhat from that used by Cover (1992) and others in that we include lags of the inflation rate as regressors. In doing so we follow Bernanke (1983), who uses such a specification to generate estimated monetary shocks in his study of the Great Depression's propagation mechanism. The negative and positive money supply shocks are defined as $u_t^- = -1/2[\text{abs}(u_t) - u_t]$ and $u_t^+ = 1/2[\text{abs}(u_t) + u_t]$, respectively. The output equation of the system is given by:

$$y_t = \beta_0 + \sum_{j=1}^q \beta_j^y y_{t-j} + \sum_{j=0}^q (\beta_j^+ u_{t-j}^+ + \beta_j^- u_{t-j}^-) + e_t, \quad (2)$$

where e_t is the output shock.

The system is estimated by multivariate maximum likelihood via the BFGS algorithm. The parameters are initialized with values yielded by OLS estimation of equations (1) and (2), and with the cross-correlation between u_t and e_t initially set to zero. We follow the practice of the unrestricted vector autoregression literature by imposing a common lag length q in the system and determine q by consideration of several standard diagnostics: the Akaike information criterion, the Schwarz information criterion, the Ljung-Box statistic, and likelihood ratio testing.

We call the system given by equations (1) and (2) the "standard model." To check the robustness of our results, we also consider several other model specifications. Note that equation (2) allows the contemporaneous values of the positive and negative monetary shocks to affect output. The first modification in the model we consider is a rather minor one, elimination of these current shocks in the output equation.

Next we augment the output equation (2) by including contemporaneous and lagged values of the

positive and negative changes to the ex-post real commercial paper rate, as in equation (3):

$$y_t = \beta_0 + \sum_{j=1}^q \beta_j^y y_{t-j} + \sum_{j=0}^q (\beta_j^+ u_{t-j}^+ + \beta_j^- u_{t-j}^-) + \sum_{j=0}^q (\theta_j^+ \Delta r_{t-j}^+ + \theta_j^- \Delta r_{t-j}^-) + v_t, \quad (3)$$

where $r_t = i_t - p_t$, $\Delta r_t^- = -1/2[\text{abs}(\Delta r_t) - \Delta r_t]$, and $\Delta r_t^+ = 1/2[\text{abs}(\Delta r_t) + \Delta r_t]$. In considering the specification given in equation (3) we follow Cover (1992), who emphasizes that the interest rate is widely believed to affect long-run capacity output and argues that shocks to aggregate demand from the IS curve may be captured by the changes in the real interest rate while shocks to the LM curve may be well represented by money supply shocks.

The final specification we study is a system estimated with nominal interest rate shocks as an alternative measure of monetary policy actions, along the lines of Bernanke and Blinder (1992), except that we separate out positive and negative shocks. Bernanke and Blinder (1992) use the federal funds rate in their analysis of post-WWII monetary transmission mechanisms, while we employ the commercial paper rate. Since the federal funds market developed only after WWII, we feel that the commercial paper rate is the best pre-WWI and interwar proxy for a short-term interest rate with features similar to those exhibited by the federal funds rate in the post-WWII period. The interest rate shock, ω_t , is obtained from a regression of the nominal commercial paper rate, i_t , on its own lags and lagged values of m_t and y_t as in equation (4):

$$i_t = \gamma_0 + \sum_{j=1}^q \gamma_j^i i_{t-j} + \sum_{j=1}^q \gamma_j^y y_{t-j} + \sum_{j=1}^q \gamma_j^m m_{t-j} + \omega_t. \quad (4)$$

The interest rate shock series are computed as $\omega_t^+ = 1/2[\text{abs}(\omega_t) + \omega_t]$ and $\omega_t^- = -1/2[\text{abs}(\omega_t) - \omega_t]$. The output equation for this system is then given by:

$$y_t = \beta_0 + \sum_{j=1}^q \beta_j^y y_{t-j} + \sum_{j=0}^q (\beta_j^+ \omega_{t-j}^+ + \beta_j^- \omega_{t-j}^-) + z_t. \quad (5)$$

We note that for the system given by equations (4) and (5), negative (positive) interest rate shocks represent positive (negative) money supply shocks, so that, e.g., if strict traditional Keynesian asymmetry holds, we

expect $\beta_i^- = 0$ for all i and $\beta_i^+ \neq 0$ for some i , whereas the opposite is expected for the coefficients on the monetary shock variables in equations (2) and (3). Unless indicated otherwise, below we use the term “monetary shock” to refer to both “money supply shocks” and “interest rate shocks.”

Karras (1996b) considers a system quite similar to equations (4) and (5), with two exceptions. First, in his panel study he uses interest rates on short-term government bonds or discount rates. Second, he includes the relative price of oil in the output equation as an aggregate supply shock proxy.

3. Empirical Results

Our results for the pre-WWI sample period are reported in Table 1. There we present p -values for Wald tests for five null hypotheses of interest: (i) the coefficients on positive monetary shocks are jointly equal to zero; (ii) the coefficients on positive monetary shocks sum to zero; (iii) the coefficients on negative monetary shocks are jointly equal to zero; (iv) the coefficients on negative monetary shocks sum to zero; and (v) the coefficients on positive and negative monetary shocks equal one another, i.e., money supply shocks are symmetric in their effect on output.

In addition to studying the full 1875:1-1914:2 pre-WWI period, we also consider two sub-samples, 1875:1-1893:4 and 1894:1-1914:2. While the sub-sample analysis is useful as a standard robustness check, it is also important to note that our first sub-sample was characterized by a relatively long period of deflation, brought about by the secular decline in the world price level measured in gold that lasted from the 1860's to the late 1890's; the monetary policy goal of the U.S. in the post-Civil War Greenback Period was to return to specie payments at pre-Civil War parity and the U.S. indeed returned to the gold standard in 1879. In contrast, our second sub-sample was a period of a generally rising price level. Thus, according to the Ball and Mankiw (1994) model, we would expect positive money supply shocks to have relatively stronger effects on output in our first sub-sample and the reverse to hold in our second sub-sample.

We feel that there are a number of good candidates in the 1890's for use as a breakpoint besides the one

we use (e.g., any of the turning points from the NBER business cycle chronology for the 1890's) and did not engage in an econometric search for an optimal breakpoint. The key criterion we did consider is that our output series achieves a global minimum in 1893:4. This breakpoint also represents the end of the Panic of 1893, a period of widespread bank failures and severe stock market declines caused, in large part, by concern that the U.S. would abandon the gold standard; see Friedman and Schwartz (1963).

The standard model results for the full pre-WWI sample period imply that both positive and negative money supply shocks strongly affect output, but do so in a symmetric fashion. When the contemporaneous money supply shocks are removed from the standard model, the results change a bit, in that the null hypothesis that the coefficients on positive money supply shocks are jointly equal to zero can no longer be rejected at conventional significance levels. In this case, however, the symmetry null continues to have a very high p -value. Adding real interest rate changes to the standard model for this sample period does not substantively alter the results. Likewise, using nominal interest rate shocks as an alternative measure of monetary policy suggests that positive and negative monetary shocks still affect output in a symmetric fashion.

On the whole, then, our full pre-WWI sample results suggest that while both positive and negative monetary shocks affect output, there is no strong evidence that they do so asymmetrically. A possible explanation for this finding of monetary shock symmetry is that there were two distinct trends in the price level over this sample period: a steady decline until the late 1890's; and the general increase afterwards, which occurred upon the heels of the discoveries of large gold deposits in, e.g., Alaska and South Africa, and improvements in gold mining and refining methods in the 1890's.

According to the standard model results for the 1875:1-1893:4 sub-sample, only the coefficients on positive money supply shocks are jointly significantly different from zero, a result that is consistent with the Ball and Mankiw (1994) model in the presence of trend deflation. However, the p -value for the money supply shock symmetry null hypothesis is extremely high. Further, when real interest rate changes are added

to the model, the evidence suggests that neither positive nor negative money supply shocks affect output and also implies that these effects are symmetric. It is useful to note that a likelihood ratio test strongly rejects the null hypothesis that these real interest rate changes should not be added to the standard model, so that the evidence in favor of the Ball and Mankiw (1994) model for this sub-sample is quite weak; full details for this and similar results are available from the authors.

The results change quite drastically when we use nominal interest rate shocks to measure monetary shocks for the 1875:1-1893:4 period. In this case the monetary shock symmetry null hypothesis is strongly rejected, and the p -values are very high for the null hypotheses that the positive and negative interest rate shock coefficients are jointly equal to zero. But, since the negative interest rate shock coefficients sum to a theoretically implausible positive number, we follow Cover (1992) in interpreting these results as evidence indicating that negative interest rate shocks do not significantly influence output in this sub-sample. Such reasoning implies that the monetary shock asymmetry suggested by this pair of estimated equations is the opposite of that expected by the Ball and Mankiw (1994) model with trend deflation. Finally, even though the nominal interest rate shock model is not nested by any of the other models estimated for this sub-sample, so that likelihood ratio testing between this and the other models is not appropriate, the log-likelihood function for this estimated model is roughly one-half that of the models which use money supply shocks to measure monetary shocks. This leads us to more so favor the monetary shock symmetry test results for the other models for the 1875:1-1893:4 sub-sample.

Our results are more uniform for the 1894:1-1914:2 pre-WWI sub-sample and tend to mirror those for the full pre-WWI period. That is, for this sub-sample the results across the four estimated models suggest that both positive and negative monetary shocks have strong and symmetric effects on output. Thus, our evidence suggests that for the pre-WWI period, both for our full sample and the two sub-samples we consider, monetary shock symmetry is the rule rather than the exception.

Table 2 reports our results for the interwar period. We supplement our full sample interwar analysis by

also examining two sub-samples, one from 1920:01-1933:03 and the other from 1933:04-1941:12. In our opinion March 1933 serves as a decidedly economically important breakpoint since, in this month, the U.S. abandoned the gold standard, the trough of the Great Depression in the U.S. was reached, and the incipient rehabilitation of U.S. financial markets began. As shown in Figure 2, our first interwar sub-sample was a period of general deflation and our second interwar sub-sample was a period of general inflation. Accordingly, the Ball and Mankiw (1994) suggests that only positive monetary shocks affect output in the 1920:01-1933:03 sub-sample and that only negative monetary shocks affect output in the 1933:04-1941:12 sub-sample.

For the full interwar sample our results suggest that both positive and negative monetary shocks have strong output effects. But, since the p -values for the symmetry null hypothesis are greater than or equal to 48% across the four estimated models, these output effects are symmetric. These results are matched pretty well by those for the 1920:01-1933:03 interwar sub-sample, which, given the deflationary behavior of this period, provides evidence against the Ball and Mankiw (1994) model. In showing that both positive and negative monetary shocks strongly affect output in the 1920:01-1933:03 sub-sample, our results provide further evidence not only that contractionary monetary policy played a large role in the early stages of the Great Depression, but also that expansionary policy, had it been pursued, could have contributed importantly to arresting the protracted fall in output in the early 1930's.

Finally, results for the 1933:04-1941:12 interwar sub-sample are quite different. First, the null hypothesis of monetary shock symmetry is very strongly rejected for all four estimated models. Second, while the null hypotheses that the coefficients on the positive and negative monetary shocks are zero are also strongly rejected, for each model the coefficients on the positive monetary shocks sum to a theoretically implausible number (a negative number for the positive money supply shocks and a positive number for the negative interest rate shocks). We once again follow Cover (1992) in concluding that these results imply that positive monetary shocks do not have strong effects on output in this sub-sample. Accordingly, only negative

monetary shocks appear to influence output in 1933:04-1941:12 sub-sample, a result that is consistent with the Ball and Mankiw (1994) model, given the generally rising price level in this sample period.

4. Appearance of Monetary Shock Asymmetry

Our results for the 1933:04-1941:12 period firmly indicate that positive and negative money shocks were indeed asymmetric in their effects on output. We conjecture that this finding results from the peculiar circumstances that prevailed institutionally and in financial markets after the Great Depression bottomed out in the U.S. in March 1933.

First, it is well known that the National Industrial Recovery Act, for a time, created industry-wide cartels and institutionalized wage and price stickiness. In this framework participants in cartels may have been more likely to agree in their codes to increase prices and wages in response to the positive monetary shocks in the 1933 to 1935 period than if they were not colluding. We can not think of a more direct manner by which monetary asymmetry can be, and perhaps was, induced.

Second, we believe that the asymmetry of negative and positive money shocks for the 1933:04-1941:12 period may have resulted from the fact that the nominal interest rate was at or close to its binding floor of zero. For example, if negative money shocks were more convincing to market participants that the deflationary regime that had existed was likely to continue than positive shocks were that it was likely to end, this would have increased the *ex ante* real interest rate more in response to negative money shocks than it was lowered in response to positive money shocks. The closer the nominal interest rate comes to its binding floor of zero, the more we should expect these effects to gain in strength. If the Federal Reserve were unwilling to drive real rates negative, then the binding floor of zero on the nominal interest rate effectively put a lower limit on downward interest rate movements. However, there was no limit on upward interest rate changes that could be produced with negative money shocks, as the recession of 1937-38 capably demonstrated.

5. Conclusions

Taken as a whole, there appears to be little support for believing that the pre-WWI and the entire interwar period should be considered historical precedents for any postwar monetary asymmetries. Our test results for both samples fail to reject the null hypothesis of symmetry in monetary shocks, and thus tend to corroborate the monetary policy symmetry results of Evans (1986) and not support DeLong and Summers' (1988) evidence in favor of pre-WWII monetary shock asymmetry.

Moreover, in the four sub-samples we consider, monetary shock asymmetry is found only in the latter portion of the Great Depression. Given the deflationary and inflationary trends across these sub-samples, our results suggest that the Ball and Mankiw (1994) model does not provide a satisfactory explanation of the relationship between output and monetary shocks during the pre-WWI period and during our first interwar sub-sample. Accordingly, we feel it is useful to recall Bernanke and Carey's (1996) questioning of theories that are compatible with macroeconomic behavior in the post-WWII era but have little explanatory power for the pre-WWII era, leading to an arguably unsatisfactory conclusion that two different theoretical frameworks are required to account for the entire period.

We speculate that our evidence of monetary shock asymmetry for the 1933:04-1941:12 sub-sample may stem from the effects of both the National Industrial Recovery Act and the fact that the nominal interest in this period was quite close to its lower bound of zero. Further analysis, which is beyond the scope of this paper, is required to investigate these suggested causes of monetary shock asymmetry evident once the economy passed the trough of the Great Depression. However, while the post-March 1933 interwar period should rightly be considered as the era in which post-WWII monetary asymmetries had their beginning, it is important to note that the same set of circumstances which we surmise rendered monetary shocks asymmetric in the 1933:04-1941:12 period has not been reproduced in the post-WWII U.S. economic experience. Thus, these proposed sources of monetary shock asymmetry should not be considered explanations for the apparent emergence of asymmetry in the effects of positive and negative monetary

shocks in the U.S. economy after 1945.

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Figure 1

Time Series Plot of Pre-WWI U.S. Quarterly Wholesale Price Index: 1875:1-1914:2



Figure 2

Time Series Plot of Interwar U.S. Monthly Wholesale Price Index: 1920:01-1941:12

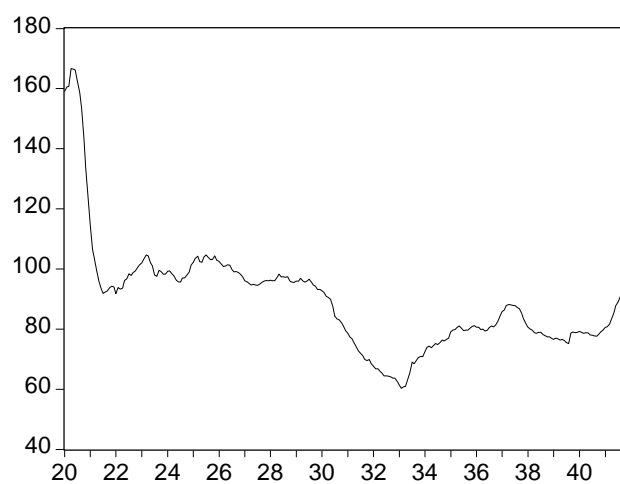


Table 1

***p*-values of Wald Tests for Pre-World War I Period**

Sample Periods	Models	Null Hypothesis				
		$\beta_i^+ = 0, \forall i$	$\sum \beta_i^+ = 0$	$\beta_i^- = 0, \forall i$	$\sum \beta_i^- = 0$	$\beta_i^+ = \beta_i^-, \forall i$
Full Sample: 1875:1-1914:2	Standard Model	3.0×10^{-3}	4.9×10^{-4}	1.0×10^{-8}	1.0×10^{-8}	0.61
	No Contemporaneous Shock	0.26	0.05	1.0×10^{-8}	1.0×10^{-8}	0.38
	Real Interest Rate Change	0.08	0.06	1.0×10^{-8}	1.0×10^{-8}	0.17
	Nominal Interest Rate Shock	1.0×10^{-8}	0.14	9.6×10^{-5}	0.04	1.00
First Sub-Sample: 1875:1-1893:4	Standard Model	3.0×10^{-3}	0.07	0.16	0.16	0.95
	No Contemporaneous Shock	0.88	0.88	0.04	0.04	0.31
	Real Interest Rate Change	0.35	0.15	0.93	0.72	0.78
	Nominal Interest Rate Shock	1.0×10^{-8}	6.4×10^{-7}	4.0×10^{-7}	1.0×10^{-8}	1.1×10^{-6}
Second Sub-Sample: 1894:1-1914:2	Standard Model	8.0×10^{-3}	0.02	4.0×10^{-4}	8.1×10^{-4}	1.00
	No Contemporaneous Shock	3.6×10^{-6}	2.2×10^{-4}	3.0×10^{-3}	0.04	0.98
	Real Interest Rate Change	1.1×10^{-4}	0.36	1.0×10^{-8}	0.04	1.00
	Nominal Interest Rate Shock	3.0×10^{-3}	0.42	5.0×10^{-3}	0.06	0.90

Notes: Columns three and five test the hypotheses that the coefficients on positive and negative money shocks, respectively, are jointly equal to zero. Columns four and six test the hypotheses that the coefficients on positive and negative money shocks, respectively, sum to zero. Column seven tests the hypothesis that the negative and positive shocks are equal and is the test of symmetry. The “Standard Model” refers to equations (1) and (2). The “No Contemporaneous Shock” model refers to equations (1) and (2), but with the current monetary shocks eliminated from equation (2). The “Real Interest Rate Change” model refers to equations (1) and (3), and the “Nominal Interest Rate Shock” model refers to equations (4) and (5).

Table 2

***p*-values of Wald Tests for Interwar Period**

Sample Periods	Models	Null Hypothesis				
		$\beta_i^+ = 0, \forall i$	$\sum \beta_i^+ = 0$	$\beta_i^- = 0, \forall i$	$\sum \beta_i^- = 0$	$\beta_i^+ = \beta_i^-, \forall i$
Full Sample: 1920:01-1941:12	Standard Model	9.5×10^{-4}	8.9×10^{-4}	7.6×10^{-6}	0.08	0.85
	No Contemporaneous Shock	9.0×10^{-3}	0.03	2.7×10^{-5}	0.96	0.48
	Real Interest Rate Change	0.09	1.0×10^{-3}	6.1×10^{-7}	3.5×10^{-4}	1.00
	Nominal Interest Rate Shock	1.0×10^{-8}	0.44	4.0×10^{-7}	0.84	0.99
First Sub-Sample: 1920:01-1933:03	Standard Model	1.9×10^{-7}	0.25	1.0×10^{-8}	3.6×10^{-4}	0.62
	No Contemporaneous Shock	2.6×10^{-4}	0.06	6.0×10^{-6}	5.0×10^{-3}	0.99
	Real Interest Rate Change	2.0×10^{-7}	0.82	1.0×10^{-8}	1.0×10^{-3}	0.74
	Nominal Interest Rate Shock	2.8×10^{-4}	0.53	3.6×10^{-4}	0.94	1.00
Second Sub-Sample: 1933:04-1941:12	Standard Model	6.5×10^{-4}	7.0×10^{-3}	1.0×10^{-8}	1.0×10^{-8}	1.4×10^{-7}
	No Contemporaneous Shock	4.0×10^{-3}	0.01	1.0×10^{-8}	1.0×10^{-8}	3.5×10^{-4}
	Real Interest Rate Change	1.4×10^{-7}	7.4×10^{-4}	1.0×10^{-8}	1.0×10^{-8}	1.0×10^{-8}
	Nominal Interest Rate Shock	1.0×10^{-8}	1.0×10^{-8}	1.0×10^{-8}	0.09	9.6×10^{-6}

Notes: See notes for Table 1.