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DOES MONETARY POLICY MATTER? NARRATIVE VERSUS STRUCTURAL APPROACHES

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ABSTRACT

This paper compares results from the narrative approach of Romer and Romer (1989) to those from the structural approach regarding the effects of monetary policy on real output. The results from both approaches lead to the conclusions that monetary policy matters and that the effects build slowly following a monetary policy shock. The narrative approach, however, leads to larger and more persistent effects than does the structural approach. Reasons are advanced in the paper as to why this might be so.

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I. Introduction

Romer and Romer (1989) use what they call the "narrative approach" to examine the effects of monetary policy on real output. This approach is in the spirit of the work of Friedman and Schwartz (1963). In defending this approach, Romer and Romer (RR) point out that statistical tests like "regressions of output on money, studies of the effects of 'anticipated' and 'unanticipated' money, and vector autoregressions ... cannot persuasively identify the direction of causation." (p. 1) This criticism, however, does not apply to the estimation of structural relationships, and the structural approach is a clear alternative to the narrative approach. The purpose of this paper is to see if the two approaches lead to similar results regarding monetary policy effects.

RR chose six months in the post-war period in which they believed there was a negative monetary shock that was independent of the level of output: October 1947, September 1955, December 1968, April 1974, August 1978, and October 1979. They defined a dummy variable, D, that is one in each of these months and zero otherwise. They next regressed the percentage change in industrial production on a constant, 11 seasonal dummy variables, 24 lags of the percentage change in industrial production, the current value of D, and 36 lags of D. The estimation period was January 1948 - December 1987. From this regression they computed the impulse response function of a one unit increase in D.

The impulse response function showed little effect on industrial production for about the first eight months after the shock, but negative and fairly large effects after that. The maximum impact was industrial production 12 percent lower after 33 months. Similar results were obtained using the level of the unemployment rate in place of the percentage change in industrial production. The maximum impact was the unemployment rate 2.1 percentage points higher after 34 months. In both cases the effects of the shocks showed considerable persistence. RR concluded from the overall results that monetary shocks have real effects.

In most structural macroeconometric models interest rates affect a number of categories of investment and at least a few categories of consumer expenditures. In this framework a test of whether monetary policy matters is simply a test of the significance of the interest rate coefficients in the estimated investment and consumption equations. In most models interest rates are significant in a number of equations, and so the RR conclusion that monetary shocks have real effects is hardly surprising to a structural model builder.

The structural approach is based on the estimation of approximations to decision equations.[1] It is open to the criticism that the estimated approximations may be seriously misspecified. Aggregation problems may be serious, inaccurate functional forms may be used, and the fact that "deep structural parameters" are not being estimated may be quantitatively important. On the other hand, the RR regressions seem even more open to the possibility of being seriously misspecified. The regressions are reduced-form like equations, and it seems likely that the regressions have left out

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[1]See Fair (1989) for discussion of this.

many variables that belong in the true reduced form equations for industrial production and unemployment. Certainly the implicit reduced form equations for output and unemployment in a typical macroeconometric model contain many more variables than are in the RR regressions.

RR examine the robustness of their results by adding supply-shock, fiscal-policy, and inflation variables to their regressions and by excluding certain shocks from the regressions. They report that adding other variables lowers the maximum impact on industrial production and unemployment slightly, but no numbers are given. When the monetary shocks in 1974 and 1979 are excluded (since they may be associated with oil price shocks), RR report that the maximum impact on industrial production falls from 12 percent to 10 percent. Although these robustness tests are of some interest, they fall far short of adding enough variables to the reduced form equations to satisfy a structural model builder.

Another problem with the RR approach is that the use of the same value of D (namely one) for each of the six shocks is a strong assumption. It seems unlikely that the Fed tightened up by the same amount in each case. As will be seen in the next section, the degree of tightening appears to have varied considerably across the shocks.

Given that both approaches are open to criticism, it is of interest to see if they lead to similar results, namely if the RR results are consistent with the properties of a structural macroeconometric model. If the results are consistent, this is to some extent support for both approaches. A structural model builder could say that although the RR regressions leave out many important variables, this misspecification does not appear to affect in a serious way the estimated effects of monetary policy on real output. RR could say that although structural models are subject to many problems, their properties regarding the effects of monetary policy on real output seem about right. If the results are not consistent, the differences may shed light on possible biases of each approach.

II. Estimated Effects of the Shocks from a Structural Model

It is fairly easy to see if the properties of a structural model are consistent with the RR results. The Fair model (1984) is used as the structural model in this paper.[2] The model is quarterly, and the data set begins in 1952 I. The October 1947 shock could not be analyzed because the data set does not go back that far.

In the regular version of the model monetary policy is endogenous. One of the stochastic equations is an interest rate reaction function, where the Fed is estimated to "lead against the wind" as real output increases, labor markets tighten, inflation increases, and the lagged growth of the money supply increases. The interest rate on the left-hand-side of this equation is the three-month Treasury bill rate, denoted RS, which is the key short term rate in the model. For the present results this equation was dropped, and RS was taken to be exogenous.

The results of the experiments are presented in Table 1, and the rest of this section is a discussion of this table. Consider Experiment 1 first.

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[2]The model consists of 30 stochastic equations and 98 identities. The main description of it is in Chapters 3 and 4 in Fair (1984). The results of adding age distribution variables to the household behavioral equations are presented in Fair and Dominguez (1989), and the equations with the age variables included are used for the current results. It can be seen in Tables 1 and 2 in this latter paper that the interest rate is highly significant in the equations explaining consumption of services, durable expenditures, and housing investment. For the present results the model was estimated by two-stage least squares for the 1954 I - 1988 IV period.

TABLE 1

Estimated Effects of Monetary Shocks from a Structural Model

EXPERIMENT 1: 1955 IV - 1960 III

		Actual value of RS	No-shock value of RS	%ΔY	%ΔIP	ΔUR
1955	I	1.26	-	-	-	-
	II	1.61	-	-	-	-
	III	1.86	-	-	-	-
	IV	2.35	1.86	.06	.11	-.02
1956	I	2.38	1.86	.21	.38	-.09
	II	2.60	1.86	.41	.74	-.19
	III	2.60	1.86	.65	1.17	-.31
	IV	3.06	1.86	.93	1.67	-.45
1957	I	3.17	1.86	1.27	2.29	-.62
	II	3.16	1.86	1.62	2.91	-.80
	III	3.38	1.86	1.94	3.49	-.98
	IV	3.34	1.86	2.28	4.13	-1.14
1958	I	1.84	1.84	2.39	4.34	-1.20
	II	1.02	1.02	2.11	3.84	-1.09
	III	1.71	1.71	1.69	3.05	-.91
	IV	2.79	2.79	1.20	2.16	-.68
1959	I	2.80	2.80	.72	1.27	-.45
	II	3.02	3.02	.25	.42	-.22
	III	3.53	3.53	-.18	-.34	.01
	IV	4.30	4.30	-.55	-1.01	.20
1960	I	3.94	3.94	-.84	-1.54	.37
	II	3.09	3.09	-1.09	-1.97	.49
	III	2.39	2.39	-1.25	-2.28	.59

TABLE 1 (continued)

EXPERIMENT 2: 1969 I - 1973 IV

		Actual value of RS	No-shock value of RS	%ΔY	%ΔIP	ΔUR
1968	II	5.51	-	-	-	-
	III	5.23	-	-	-	-
	IV	5.58	-	-	-	-
1969	I	6.14	5.58	.05	.09	-.02
	II	6.24	5.58	.17	.30	-.07
	III	7.05	5.58	.37	.66	-.16
	IV	7.32	5.58	.69	1.23	-.31
1970	I	7.26	5.58	1.03	1.84	-.48
	II	6.75	5.58	1.29	2.32	-.62
	III	6.38	5.58	1.42	2.55	-.70
	IV	5.36	5.36	1.41	2.54	-.71
1971	I	3.86	3.86	1.21	2.17	-.63
	II	4.21	4.21	.98	1.76	-.53
	III	5.05	5.05	.71	1.27	-.39
	IV	4.23	4.23	.43	.77	-.26
1972	I	3.44	3.44	.15	.26	-.12
	II	3.75	3.75	-.10	-.19	.00
	III	4.24	4.24	-.32	-.58	.11
	IV	4.85	4.85	-.49	-.88	.20
1973	I	5.64	5.64	-.62	-1.10	.27
	II	6.61	6.61	-.71	-1.27	.32
	III	8.39	8.39	-.77	-1.37	.36
	IV	7.46	7.46	-.79	-1.39	.37

EXPERIMENT 3: 1974 II - 1979 I

		Actual value of RS	No-shock value of RS	%ΔY	%ΔIP	ΔUR
1973	III	8.39	-	-	-	-
	IV	7.46	-	-	-	-
1974	I	7.60	-	-	-	-
	II	8.27	7.60	.06	.10	-.02
	III	8.29	7.60	.17	.30	-.06
	IV	7.34	7.34	.24	.40	-.10
1975	I	5.87	5.87	.25	.41	-.11
	II	5.40	5.40	.23	.37	-.10
	III	6.34	6.34	.20	.29	-.08
	IV	5.68	5.68	.16	.22	-.07
1976	I	4.95	4.95	.11	.13	-.05
	II	5.17	5.17	.07	.05	-.03
	III	5.17	5.17	.02	-.02	-.01
	IV	4.70	4.70	-.02	-.09	.01
1977	I	4.62	4.62	-.05	-.16	.02
	II	4.83	4.83	-.08	-.21	.04
	III	5.47	5.47	-.10	-.24	.05
	IV	6.14	6.14	-.11	-.27	.05
1978	I	6.41	6.41	-.12	-.29	.06
	II	6.48	6.48	-.12	-.29	.06
	III	7.32	7.32	-.12	-.28	.06
	IV	8.68	8.68	-.11	-.27	.06
1979	I	9.36	9.36	-.10	-.25	.05

TABLE 1 (continued)

EXPERIMENT 4: 1978 III - 1983 II

		Actual value of RS	No-shock value of RS	%ΔY	%ΔIP	ΔUR
1977	IV	6.14	-	-	-	-
1978	I	6.41	-	-	-	-
	II	6.48	-	-	-	-
	III	7.32	6.48	.07	.12	-.02
	IV	8.68	6.48	.31	.53	-.10
1979	I	9.36	6.48	.69	1.20	-.26
	II	9.37	6.48	1.12	1.97	-.46
	III	9.63	6.48	1.49	2.62	-.70
	IV	11.80	11.80	1.60	2.81	-.90
1980	I	13.46	13.46	1.49	2.60	-.92
	II	10.05	10.05	1.33	2.33	-.82
	III	9.24	9.24	1.06	1.85	-.67
	IV	13.71	13.71	.74	1.28	-.50
1981	I	14.37	14.37	.40	.70	-.33
	II	14.83	14.83	.09	.15	-.17
	III	15.09	15.09	-.19	-.35	-.02
	IV	12.02	12.02	-.45	-.80	.12
1982	I	12.90	12.90	-.68	-1.20	.23
	II	12.36	12.36	-.85	-1.50	.32
	III	9.71	9.71	-.99	-1.74	.38
	IV	7.94	7.94	-1.07	-1.89	.43
1983	I	8.08	8.08	-1.09	-1.95	.45
	II	8.42	8.42	-1.06	-1.90	.45

EXPERIMENT 5: 1978 III - 1983 II

		Actual value of RS	No-shock value of RS	%ΔY	%ΔIP	ΔUR
1977	IV	6.14	-	-	-	-
1978	I	6.41	-	-	-	-
	II	6.48	-	-	-	-
	III	7.32	6.48	.07	.12	-.02
	IV	8.68	6.48	.31	.53	-.10
1979	I	9.36	6.48	.69	1.20	-.26
	II	9.37	6.48	1.12	1.97	-.46
	III	9.63	6.48	1.49	2.62	-.70
	IV	11.80	6.48	2.04	3.59	-1.04
1980	I	13.46	6.48	2.77	4.88	-1.44
	II	10.05	6.48	3.43	6.04	-1.75
	III	9.24	6.48	3.66	6.45	-1.84
	IV	13.71	6.48	3.99	7.03	-1.95
1981	I	14.37	6.48	4.41	7.77	-2.14
	II	14.83	6.48	4.96	8.75	-2.37
	III	15.09	6.48	5.44	9.58	-2.57
	IV	12.02	6.48	5.66	9.98	-2.65
1982	I	12.90	6.48	5.66	9.99	-2.63
	II	12.36	6.48	5.38	9.50	-2.49
	III	9.71	6.48	4.77	8.42	-2.23
	IV	7.94	6.48	3.71	6.52	-1.78
1983	I	8.08	6.48	2.44	4.25	-1.24
	II	8.42	6.48	1.16	1.99	-.68

TABLE 1 (continued)

EXPERIMENT 6: 1979 IV - 1984 III

		Actual value of RS	No-shock value of RS	%ΔY	%ΔIP	ΔUR
1979	I	9.36	-	-	-	-
	II	9.37	-	-	-	-
	III	9.63	-	-	-	-
	IV	11.80	9.63	.18	.32	-.05
1980	I	13.46	9.63	.63	1.10	-.22
	II	10.05	9.63	.92	1.61	-.38
	III	9.24	9.63	.94	1.65	-.43
	IV	13.71	9.63	1.21	2.12	-.51
1981	I	14.37	9.63	1.70	2.97	-.70
	II	14.83	9.63	2.30	4.01	-.94
	III	15.09	9.63	2.90	5.06	-1.22
	IV	12.02	9.63	3.25	5.69	-1.40
1982	I	12.90	9.63	3.43	6.00	-1.49
	II	12.36	9.63	3.40	5.95	-1.48
	III	9.71	9.63	3.03	5.31	-1.35
	IV	7.94	7.94	2.38	4.17	-1.09
1983	I	8.08	8.08	1.62	2.81	-.77
	II	8.42	8.42	.81	1.39	-.43
	III	9.19	9.19	.06	.07	-.10
	IV	8.79	8.79	-.62	-1.10	.20
1984	I	9.13	9.13	-1.18	-2.07	.47
	II	9.84	9.84	-1.64	-2.86	.69
	III	10.34	10.34	-2.00	-3.46	.87

Notes:

RS = Three-month Treasury bill rate.

%ΔY = Percentage deviation of real GNP from its base value in percentage points.

%ΔIP = Percentage deviation of industrial production from its base value in percentage points.

ΔUR = Change in the unemployment rate from its base value in percentage points.

September 1955 is one of the RR shock months. It can be seen from the table that RS rose from 1.86 in 1955 III to 2.35 in 1955 IV. It rose further after that and continued to be above 1.86 until 1958 I. In order to run the experiment, one has to choose what the Fed would have done had there been no shock. As can be seen in the table, the assumption here is that the Fed would have kept the interest rate at 1.86 through 1957 IV. In other words, the Fed would not have allowed interest rates to rise in 1956 and 1957. After 1957 IV, the assumption is that the shock was over, and the values of RS are simply set to their actual values.

The question to ask of the model is how would the economy have differed had there been no monetary shock? For Experiment 1, the five-year period 1955 IV - 1960 III was considered. The estimated error terms were first added to the stochastic equations of the model and taken to be exogenous. This means that when the model is solved using the actual values of all the exogenous variables, a perfect tracking solution is obtained. The solution values of the endogenous variables are simply the actual values. The model was then solve for the new (non-shock) values of RS. The difference between the solution value of an endogenous variable and its actual value for a given quarter is an estimate of the effect of the shock on the variable. The results for three endogenous variables are reported in Table 1: real GNP (Y), industrial production (IP), and the unemployment rate (UR).[3]

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[3] Industrial production is not a variable in the regular version of the model. For purposes of this paper it is useful to be able to predict industrial production because this is the output measure used by RR. Therefore, a simple link from real output (Y) to industrial production (IP) was estimated. The equation is:

$$\underset{}{\log IP} = \underset{(13.32)}{-12.6} + \underset{(15.49)}{1.54\log Y}, \quad \underset{(111.49)}{\rho = .993}, \quad SE = .0132, \quad R^2 = .999,$$

where ρ is the estimated first order serial correlation coefficient of the error term and the numbers in parentheses are t-statistics in absolute

The results for Experiment 1 show that the peak effect on all three variables is 10 quarters after the change. This is close to the RR number of 33 or 34 months. In addition, the effects for the first two or three quarters are fairly small, which is consistent with the RR results. On the other hand, the sizes of the peak effects are much smaller here. For industrial production the peak effect is 4.34 percent, which compares to the RR number of 10 to 12 percent. For the unemployment rate the peak effect is 1.20 percentage points, which compares to about 2 percentage points for RR. Also, the effects here are less persistent than those reported by RR. In fact, after about four years the signs of the changes are reversed. The shock has generated a small cycle.

The same procedure was followed for the other experiments. For Experiment 2 the solution period was 1969 I - 1973 IV. In this case the results in Table 1 show that the peaks are reached after 7 or 8 quarters. The sizes of the changes for Experiment 2 are slightly smaller than those for Experiment 1.

Experiment 3 covers the 1974 II - 1979 I period. Although RR chose April 1974 as a shock month, the overall shock in this case was much smaller than the others as measured by the size and duration of the increase in RS from the base quarter. Only in 1974 II and III was RS higher than the base-quarter value of 7.60. The results for Experiment 3 show that this shock had fairly small effects as estimated by the model.

The two remaining RR shock months are August 1978 and October 1979. It is somewhat unclear whether the August 1978 shock should be assumed to end in October 1979 or continue after that. For Experiment 4 the shock was

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value. The equation was estimated by ordinary least squares for the 1954 I - 1988 IV period.

assumed to end in October 1979, and for Experiment 5 it was assumed to continue to the end of the solution period. For Experiment 4 the peak impact occurs after 6 quarters, with the effect on industrial production being 2.81 percent, and for Experiment 5 the peak impact occurs after 15 quarters, with the effect on industrial production being 9.99 percent. The peak effects on the unemployment rate are .92 and 2.65 percentage points respectively. Note that for Experiment 5 the shock is quite large: RS is held to 6.48 percent through the period in which the actual values reached double digits.

Experiment 6 is for the shock that began in October 1979. The effects here are also fairly large. The peak effects are after 10 quarters, with the effect on industrial production of 6.00 percent and the effect on the unemployment rate of 1.49 percentage points.

It should be noted that the present results would not be changed very much if the beginning quarter for each shock was taken to be one quarter sooner than what was in fact done. In each case, as can be seen in Table 1, the interest rate in the quarter sooner is close to the interest rate in the quarter actually used. For Experiment 1, for example, the interest rate in the quarter sooner is 1.61, which is only slightly smaller than the value of 1.86 used. The results in Table 1 are thus not sensitive to timing issues of this kind.

What do the overall results in Table 1 say about the RR results? There are four main messages. First (a point that is not model specific), the size and duration of the shocks as measured by the interest rate deviations vary considerably across the five shock periods. It is thus not clear that RR's use of one for all six nonzero values of D is accurate. Second, the RR result that the initial effects are small and the peak effect occurs after

33 to 34 months is consistent with some loose average of the results in Table 1. Third, the persistence of the RR effects is inconsistent with the results in Table 1, which in fact show small cycles being generated. Fourth, the RR maximum effects of 10 to 12 percent for industrial production and 2.1 percentage points for the unemployment rate are on average higher than the maximum effects in Table 1. Only for Experiment 5 are the peak effects similar.

III. Conclusion

In structural macroeconometric models monetary policy matters because interest rates are significant explanatory variables in investment and consumption equations. The RR conclusion that monetary policy matters is clearly consistent with this. Likewise, the timing of the effects from the initial shock to the peak impact is similar between the two approaches, which is encouraging to both. The main inconsistencies are the larger estimated effects for RR and their persistence.

The persistence differences may stem from so many variables being excluded from the RR regressions. These regressions are likely to be much more autoregressive than the implied reduced form equations of structural models. There are, for example, a number of channels through which cycles can be generated in structural models following an interest rate shock. As the economy expands, prices may initially rise faster than nominal wages, which eventually has a negative effect on demand. Also, stocks of durable goods, housing, and capital are built up during an expansion, and these eventually have a negative effect on further increases in durable expenditures, housing investment, and plant and equipment investment. The increase in prices also has negative real wealth effects. In the present model the eventual negative effect from the build up of the stocks of durable goods, housing, and capital is the main cause of the cycles in Table 1.[4] Since the RR regressions do not incorporate stock effects of this kind, it is not surprising that they show more persistence than does the structural model.

It is less clear why monetary policy effects are larger for RR than they are for the structural model. It may be that interest rate effects are underestimated in the structural model through misspecification of the structural equations. Or it may be that by treating all shocks as the same, the RR regressions give undue weight to the large shocks in 1978 and 1979 and thus bias upward the estimated size of the monetary policy effects. More sensitivity tests are needed before much can be said about this.

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[4]Although not shown in Table 1, the cycles damp down over time. After a few more quarters, the negative changes begin to reverse themselves. No coefficient restrictions have been imposed in the estimation of the model regarding either short run or long run effects.

REFERENCES

Fair, Ray C., Specification, Estimation, and Analysis of Macroeconometric Models, Harvard University Press, 1984.

_______, "Testing the Rational Expectations Hypothesis in Macroeconometric Models, mimeo, May 1989.

_______, and Kathryn M. Dominguez, "Effects of the Changing U.S. Age Distribution on Macroeconomic Equations," mimeo, revised May 1989.

Friedman, Milton, and Anna Jacobson Schwartz, A Monetary History of the United States, 1867-1960, Princeton University Press, 1963.

Romer, Christina, and David Romer, "Does Monetary Policy Matter? A New Test in the Spirit of Friedman and Schwartz," NBER Working Paper No. 2966, May 1989.