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ARE DEEP RECESSIONS FOLLOWED
BY STRONG RECOVERIES?

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Research Paper

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Are Deep Recessions Followed by Strong Recoveries?¹

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Abstract: We examine the hypothesis that deep recessions are followed by strong recoveries using a monthly data set for industrial production covering the period 1884-1990. There is a statistically significant relationship between growth in the first twelve months of a recovery and the peak-to-trough decline in industrial activity. This effect is still found when we exclude the Great Depression from our sample. We find no evidence that the length of the recession affects the strength of the subsequent recovery.

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1. Introduction

Is it the case that the further economic activity falls over the course of a recession, the faster it will grow in the initial stages of the subsequent recovery? Our interest in this question was spurred by the commonly expressed idea that the recovery from the 1990-1991 recession would be weak because the recession itself was not very severe.² Furthermore, the notion of a "bounce-back" or "rubber-band" effect following declines in economic activity contains a certain amount of intuitive appeal. This view of what causes the economy to grow in the early stages of an expansion is implicit in many theories of the business cycle, from contemporary real business cycle theories to more traditional potential output gap explanations.

Yet we rarely, if ever, see this idea made explicit in the business cycle literature. This may be because most theories of the business cycle focus on explaining either the determination of the level of output at some point in time, or the determination first and second moments of output and other important aggregates over some fixed time span. In this paper, we focus solely on the behaviour of output during and immediately after recessions. Each recession is viewed as an independent event, and we look for regularities common to the 23 recessions and recoveries that the United States has experienced over the past hundred years.

²See for example "What's so bad about a nice little recovery?" Alan S. Blinder, Business Week, p.22, June 24, 1991, "Sam, Sam the paranoid man" The Economist, p.13, January 18th, 1992.

2. The U.S. Experience With Recessions

According to the NBER (see Burns and Mitchell (1946) Table 16, Moore (1983) Table A-1) the United States has experienced 30 recessions since the middle of the nineteenth century, where a recession is identified with a peak-to-trough movement in economic activity. The NBER chronology dates business cycle peaks and troughs by month. Thus a monthly indicator of economic activity would seem to be appropriate for examining the hypothesis that deep recessions are followed by strong recoveries. A natural choice in this regard is industrial production, as measured by the Federal Reserve Board's Index of Industrial Production (see Federal Reserve Board (1990)). This Index has the advantage of extending back to 1919, thus adding to the sample of recessions we can look at. The obvious drawback with industrial production is that it is an incomplete indicator of aggregate economic activity: industrial production currently accounts for only about one fifth of total output. It would probably be better to look at a broader measure of output, such as GNP. However GNP estimates are only available on a quarterly basis, and then only as far back as 1947. Since 1945, there have only been nine recessions, including the 1990-1991 recession. The relative infrequency of recessions poses problems for attempts to examine statistically the relationship between declines in economic activity and subsequent recoveries using only post-World War II data.³

Since the Federal Reserve Index starts in 1919, it extends the sample of

³In fact, we looked for evidence of a bounce-back effect in the quarterly GNP data using the official estimates for the postwar period and interpolated estimates from Balke and Gordon (1986) for the period prior to World War II. We found weaker evidence of a bounce-back effect, but were unable to conclude whether this was due to the absence of such an effect outside the industrial sector or noise in the data.

recessions we can look at by including the interwar period. It is possible to extend the sample period further to include the period prior to World War I using the industrial production index constructed by Miron and Romer (1990). Their index covers the period 1884-1940, overlapping with the Fed index for 21 years (5 recessions). The Miron-Romer index was designed to improve upon the older Persons and Babson indexes which made heavy use of indirect proxies for industrial activity (such as imports and exports in the case of the Babson index, and bank clearings in the case of the Persons index). Miron and Romer note that their series has turning points (i.e. peaks and troughs) that are "grossly similar to but subtly different from existing series."⁴

Figure 1 presents a scatter plot of the peak-to-trough change in industrial production and growth in the first 12 months of recovery combining the Fed and Miron-Romer indexes. A 135-degree line is included for reference. The scatter of points in Figure 1 suggests the existence of some degree of self-correction in the industrial sector. The Great Depression, for which we have observations from both indexes, is obviously very influential in suggesting the existence of a self correcting mechanism, but it is clear that there is more going on.⁵ The Miron-Romer index is less comprehensive than

⁴This can be interpreted as a drawback of the series or as suggesting a need to reconsider the dating of pre-World War I business cycles using the improved index. In this paper we adhere to the NBER dating.

⁵The recovery from the Great Depression of 1929-1933 has recently been examined in some detail by Romer (1991). The specific question she addresses is what proportion of the extraordinary rates of real GNP growth observed in the mid- and late-1930's can be attributed to the severity of the downturn, and what proportion can be attributed to monetary and fiscal stimuli to aggregate demand. She finds that stimulative monetary policy in the form of unsterilized gold inflows played a key role in the recovery, and concludes that her findings suggest that "any self-corrective response of the U.S. economy to low output was weak or non-existent in the 1930s."(p.1)

the Fed index, and produces some anomalous observations. Specifically, the Miron-Romer index shows industrial production increasing in two of the pre-World War I recessions (namely the recessions of 1895:12-1897:6 and 1902:9-1904:8), and one of the post-World War I recessions (1926:10-1927:11). The Miron-Romer index also shows industrial production increasing during the post-World War I recession (1918:8-1919:3). The rapid rate of recovery from the 1913:1-1914:12 recession (output declined 22.2% from peak to trough, and grew 69.1% in the first twelve months of the recovery) may reflect the incomplete coverage of the Miron-Romer index, or it may be due to a boost in export demand as a result of World War I.

3. Empirical Analysis

Our strategy for testing for the existence of a bounce-back effect was to estimate a simple linear regression model of the form

$$\left[\frac{Y_{T+12} - Y_T}{Y_T}\right]_i = \alpha_0 + \alpha_1\left[\frac{Y_T - Y_P}{Y_P}\right]_i + \alpha_2[T - P]_i + \epsilon_i$$

where Y is some measure of output, T denotes the month of a business cycle trough as determined by the NBER chronology, P denotes the month of a business cycle peak, i indexes recessions and ϵ is an error term. The dependent variable is the percentage increase in output in the twelve months following the trough month.⁶ The explanatory variables, apart from the constant, are

⁶We also looked at growth in industrial production in the first six months and the first nine months following the trough and obtained similar results. Looking at growth beyond twelve months is complicated by the fact that for three of the recessions in our sample the subsequent expansion lasted twelve months or less.

the peak-to-trough change in output in percentage terms and the length of the recession in months. If deep recessions are followed by strong recoveries, the estimate of α_1 should be negative. If long recessions are followed by strong recoveries, the estimate of α_2 should be positive.

Table 1 reports estimates of this model using the Federal Reserve's Industrial Production Index, and three sub-components thereof, namely manufacturing production, durables manufacturing and nondurables manufacturing.⁷ Results are reported both with and without the length of recession variable on the right hand side. The sample includes fourteen recessions, starting with the 1920:1-1921:7 recession, and ending with the 1981:7-1982:11 recession. For each of the categories of production there is a statistically significant relationship between the size of the peak-to-trough decline and growth in the twelve month period following the trough. The size of the bounce-back effect is strongest for durables manufacturing. Recession length makes no difference to the strength of the recovery in industrial production, but does seem to be important for manufacturing industry. Within manufacturing, recovery in the durable goods sector seems to be more affected by the length of the recession than the recovery in the nondurables sector. For all of the sectors, including the length of the recession as an additional variable on the right hand side lessens the bounce-back effect but does not eliminate it.

Since the sample period includes the Great Depression, the most severe contraction in economic activity that the United States has experienced, the results in Table 1 may be overly influenced by this extraordinary event.

⁷The estimates in Tables 1 and 2 were obtained using seasonally adjusted data, whereas those in Table 3 use unadjusted data. The use of seasonally adjusted data makes no difference to our results.

Table 2 reports results from estimation of the model when the Great Depression is excluded from the sample. As we might have expected, there is some loss of statistical significance, but the results are broadly similar to those in Table 1. Note that the length of the recession is no longer significant in explaining growth during the first twelve months of recovery when the Great Depression is excluded from the sample.

We also estimated the model using the Miron-Romer index. These results are reported in Table 3. Again we find evidence of a significant self-correction mechanism in industrial production. The inclusion of recession length as an additional explanatory variable makes no difference to this finding, nor does excluding the Great Depression. Table 3 also reports the results of combining the Fed and Miron-Romer indexes. The Miron-Romer index overlaps with the Fed index for the period 1919:1 to 1940:12, which includes five recessions. We report results combining the two indexes when the Fed index is used for the overlapping period (the first set of results) and when the Miron-Romer index is used for the overlapping period (the second set of results). Either way we find a significant bounce-back effect. The key difference has to do with the size rather than the significance of the effect: use of the Miron-Romer index for the interwar period indicates a somewhat stronger effect than we find with the Fed index.

4. Conclusions

In this paper we have examined how rapidly industrial production recovers in the twelve month period following a business cycle trough. We considered two variables as candidates to explain differences in growth rates between recoveries, namely the depth and length of the prior recession. We

found that there is a statistically significant relationship between the rate of growth of output in the twelve month period following a business cycle trough and the size of the decline in output from peak to trough. Furthermore the bounce-back effect appears to be stronger in durables manufacturing than in nondurables manufacturing. The existence of this bounce-back effect does not depend on the inclusion of the Great Depression in our sample. However, the length of the recession makes a difference for the strength of the subsequent recovery only if the recovery following the Great Depression is included in the sample.

We are impressed by the robustness of the bounce-back effect that seems to characterize the industrial sector. Elsewhere (see Balke and Wynne (1992)) we have explored the implications of this finding for some common statistical models of industrial output. These results may also have implications for theories of the business cycle, an avenue of research we are currently exploring.

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Table 1				
Rate of growth during the first twelve months of recovery				
	Constant	Change from peak to trough	Length of recession	\bar{R}^2
Industrial production	8.24** (2.79)	-0.63*** (0.13)	-	0.64
"	6.27 (3.25)	-0.47** (0.19)	0.34 (0.30)	0.65
Manufacturing	9.13** (3.35)	-0.62*** (0.14)	-	0.58
"	5.19 (3.58)	-0.35* (0.19)	0.63* (0.31)	0.66
Durables Manufacturing	-0.69 (8.22)	-1.31*** (0.24)	-	0.68
"	-10.50 (8.24)	-0.83** (0.29)	1.61** (0.70)	0.77
Nondurables manufacturing	9.00*** (1.16)	-0.42*** (0.10)	-	0.59
"	6.90*** (1.51)	-0.24* (0.13)	0.26* (0.13)	0.66

Notes to Table 1 All data seasonally adjusted. The sample period is 1919:1 to 1991:12, which includes 14 recessions, not counting the 1990-91 recession. The dependent variable is the rate of growth during the first twelve months of recovery (defined as trough to trough plus twelve months). Standard errors are in parentheses. *** denotes significance at the 1% level; ** denotes significance at the 5% level; * denotes significance at the 10% level.

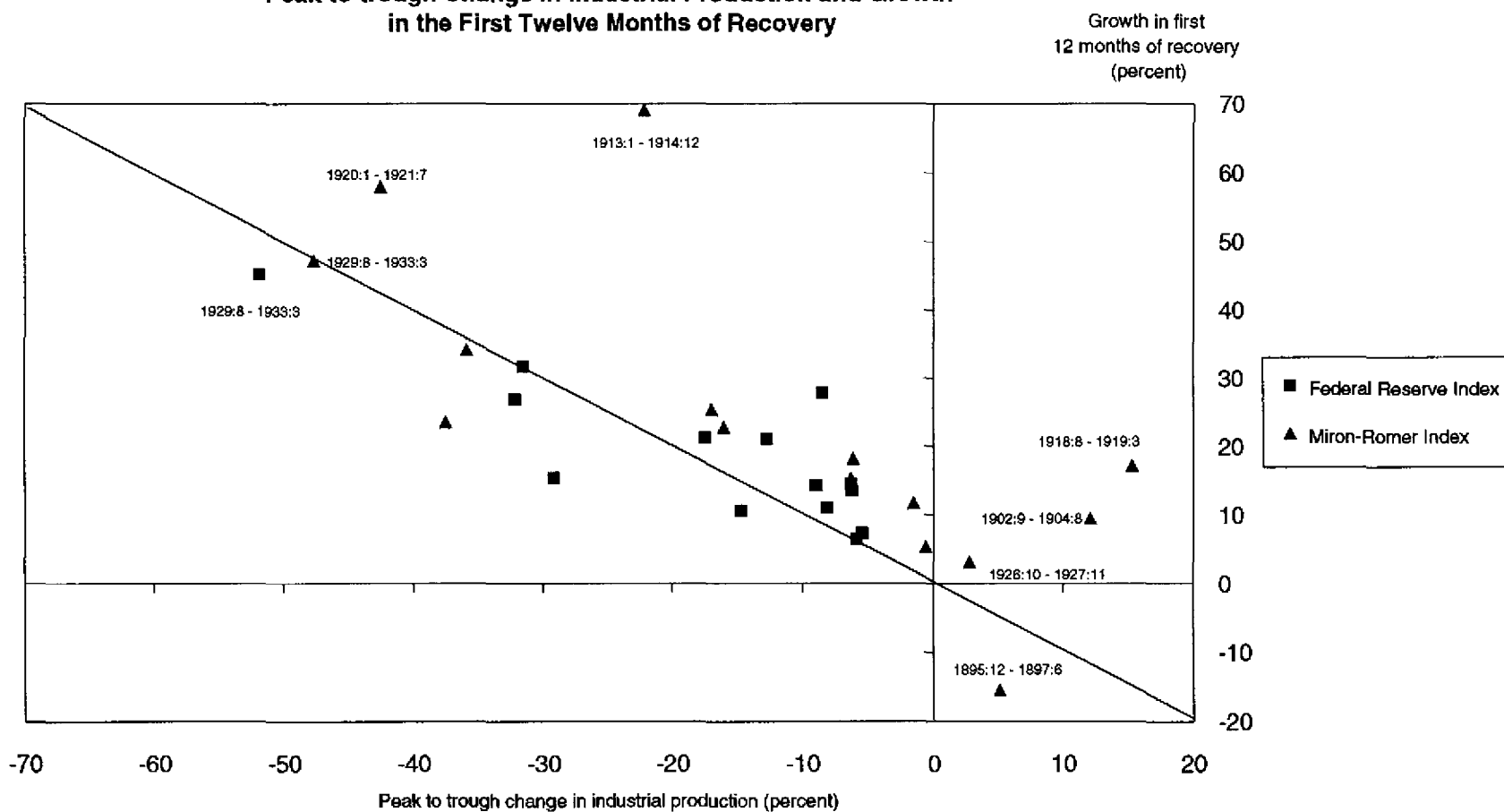
Table 2				
Rate of growth during the first twelve months of recovery Excluding the Great Depression				
	Constant	Change from peak to trough	Length of recession	\bar{R}^2
Industrial production	9.72** (3.22)	-0.51** (0.19)	-	0.35
"	6.26 (6.73)	-0.47** (0.20)	0.34 (0.57)	0.31
Manufacturing	11.51** (3.64)	-0.43** (0.19)	-	0.25
"	2.99 (7.39)	-0.36* (0.19)	0.81 (0.62)	0.30
Durables Manufacturing	5.52 (8.62)	-0.97*** (0.31)	-	0.43
"	-16.19 (16.88)	-0.84** (0.31)	2.09 (1.42)	0.48
Nondurables manufacturing	9.61*** (1.12)	-0.28** (0.12)	-	0.29
"	7.69 (3.09)	-0.24 (0.14)	0.19 (0.28)	0.25

Notes to Table 2 See notes to Table 1 for variable definitions.

Table 3					
Rate of growth during the first twelve months of recovery					
Results using the Miron-Romer index					
	Constant	Change from peak to trough	Length of recession	\bar{R}^2	N
Miron-Romer Index	12.48** (4.80)	-0.79*** (0.20)	-	0.50	14
"	8.95 (9.56)	-0.75*** (0.24)	0.24 (0.56)	0.47	14
(Excluding the Great Depression)	12.42** (5.00)	-0.82*** (0.24)	-	0.45	13
"	-3.12 (15.23)	-0.80*** (0.24)	1.04 (0.96)	0.46	13
Combined Fed-Miron- Romer Index ^a	11.09*** (3.23)	-0.66*** (0.17)	-	0.37	23
"	6.49 (5.67)	-0.57*** (0.20)	0.38 (0.39)	0.37	23
(Excluding the Great Depression)	11.18*** (3.38)	-0.65*** (0.22)	-	0.26	22
"	1.02 (8.40)	-0.65*** (0.21)	0.76 (0.58)	0.29	22
Combined Miron-Romer- Fed Index ^b	10.66*** (3.37)	-0.75*** (0.17)	-	0.46	23
"	5.47 (5.99)	-0.68*** (0.18)	0.42 (0.40)	0.46	23
(Excluding the Great Depression)	10.69*** (3.47)	-0.75*** (0.19)	-	0.39	22
"	-1.71 (8.67)	-0.74*** (0.19)	0.94 (0.60)	0.43	22

Notes to Table 3 All data not seasonally adjusted. (a) Combined Fed Miron-Romer index using Fed index for the overlapping observations in the interwar period. (b) Combined Miron-Romer Fed index using the Miron-Romer index for the overlapping observations in the interwar period.

Figure 1
Peak-to-trough Change in Industrial Production and Growth
in the First Twelve Months of Recovery



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