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Should the Discount Rate be a Penalty Rate?

By J. A. Cacy,
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The Federal Reserve Board announced in October 1979 that greater emphasis would be placed on reserves in monetary policy implementation. Since that time, however, the growth rates of both reserves and money have continued to display considerable short-run variability. As a result, some observers have concluded that the Federal Reserve needs to exercise closer short-run control over reserves in order to achieve its monetary objectives. In particular, it has been suggested that the Federal Reserve should maintain the discount rate above market rates to reduce the size and variability of discount window borrowing. Because depository institutions would be required to pay a premium for funds obtained through the discount window, keeping the discount rate above market rates is often referred to as a penalty discount rate mechanism.

Advocates of a penalty rate argue that the current method of administering the discount

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rate impairs the effectiveness of the reserve approach to monetary control and maintain that reduction in the variability of borrowing would eliminate a major "leakage" in the monetary control mechanism. These analysts contend that a penalty discount rate would facilitate monetary control because it would enable the Federal Reserve to better control the supply of reserves. Thus, advocates of a penalty rate believe that it is a necessary component of a reserve approach to monetary control.¹

Opponents of a penalty rate argue that a substantial reduction in the variability of discount window borrowing would be inadvisable. They maintain that variability in discount window borrowing furnishes a safety valve that provides depository institutions with the necessary flexibility to adjust to variations in the demand for and supply of reserves.

¹ For a description of the reserves approach to monetary control, see J. A. Cacy, "Monetary Policy in 1980 and 1981," *Economic Review*, Federal Reserve Bank of Kansas City, December 1980. The role of the discount rate under the new operating procedures is discussed in Gordon H. Sellon, Jr., "The Role of the Discount Rate in Monetary Policy: A Theoretical Analysis," *Economic Review*, Federal Reserve Bank of Kansas City, June 1980, pp. 3-15.

Moreover, opponents of a penalty rate deny that less variability in discount window borrowing would necessarily improve the Federal Reserve's control of reserves and money. Indeed, they maintain that a penalty discount rate may prove to be inconsistent with the reserve approach to monetary control.

The purpose of this article is to evaluate the impact of a penalty discount rate on monetary policy implementation. The article first discusses the effects of a penalty rate on the Federal Reserve's ability to control the supply of reserves. Next, the question of whether it is consistent with a reserve approach to monetary control is analyzed. Then, the article discusses the impact of a penalty rate on monetary control, under the assumption that it is consistent with reserve targeting. Finally, the article examines the impact of a penalty rate on the volatility of interest rates.

A PENALTY DISCOUNT RATE AND THE SUPPLY OF RESERVES

This section discusses the impact of a penalty rate on the Federal Reserve's ability to control the supply of reserves. The supply of reserves—that is, the volume of reserves available to the nation's depository institutions—may arise from three different sources. One source is reserves supplied through borrowing from the Federal Reserve. Commercial banks that are members of the System have for many years had access to credit from their Federal Reserve Banks. Under the Monetary Control Act of 1980, this access was extended in mid-1980 to nonmember commercial banks and other depository institutions. While a number of circumstances may give rise to discount window borrowing, most of the credit extended by the Federal Reserve is used to facilitate short-run adjustments that depository institutions make in meeting their legally established reserve requirements.

Under the nonpenalty rate approach currently employed, the interest rate charged on discount window credit is typically maintained somewhat below rates on alternative sources of funds, such as the Federal funds rate. For this reason, banks typically have an interest rate incentive to borrow from the Federal Reserve, although borrowing is held down by a "reluctance to borrow" philosophy on the part of banks and by the System's administrative procedures governing access to the discount window. Nevertheless, in borrowing from the Federal Reserve, depository institutions are influenced by market interest rates and their relation to the discount rate. Thus, during periods of rising interest rates, when the spread between market rates and the discount rate tends to widen, borrowing from the Federal Reserve tends to increase. Similarly, borrowing tends to decline during periods of falling market interest rates. Under a penalty discount rate, in contrast, in which the discount rate would be maintained above market interest rates, the volume of borrowing would not respond to changes in interest rates.

A second source of reserves is Federal Reserve open market operations—that is, the buying and selling of U.S. government securities by the Federal Reserve. For example, funds from an open market purchase are deposited in a commercial bank and thereby increase the supply of reserves.

A third source of reserves is technical market factors—that is, various assets and liabilities of the Federal Reserve that are not controllable by the System. For example, an unexpected outflow from Treasury deposits at the Federal Reserve would provide reserves to the banking system. Reserves provided through open market operations and technical factors are referred to as nonborrowed reserves—that is, reserves supplied through sources other than borrowing at the discount window. The total supply of reserves may be written as:

$$TR^S = NBR_0 + NBR_T + BR$$

where TR^S = total supply of reserves,
 NBR_0 = reserves supplied through
 open market operations,
 NBR_T = reserves supplied by
 technical factors, and
 BR = reserves supplied through
 the discount window.

The Federal Reserve affects the supply of reserves by controlling open market operations, NBR_0 , and by affecting borrowing by establishing the discount rate. The System's ability to precisely control the supply of reserves, TR^S , depends on its ability to predict and offset variations in technical factors, NBR_T , and borrowing, BR .

To the extent that unexpected changes occur in technical factors, a penalty discount rate would not increase the Federal Reserve's ability to control the supply of reserves. Under a nonpenalty rate, unexpected changes in technical factors tend to be partly offset by changes in borrowing, reducing the undesirable impact on reserves of such variations in technical factors. Under a penalty rate, though, borrowings do not change in response to changes in technical factors.

For example, suppose the Federal Reserve, wanting total reserves to remain unchanged and expecting no change in technical factors or borrowings, maintains NBR_0 unchanged. Now suppose NBR_T declines unexpectedly. The drop in reserves provided by technical factors would tend to reduce total reserves, which would place upward pressure on interest rates. Under a nonpenalty discount rate, the rise in interest rates would lead to an increase in borrowing, thereby offsetting some of the decline in technical factors. Under a penalty discount rate, total reserves would decline by the amount of the drop in technical factors because borrowing would not increase in response to the

rise in interest rates. Under a penalty rate, compared to a nonpenalty rate, then, total reserves would deviate from desired behavior by a larger amount.

Nevertheless, despite the tendency for a penalty rate to prevent changes in borrowing from countering unexpected changes in technical factors, a penalty rate would probably improve the Federal Reserve's ability to control the supply of reserves. This is because a penalty rate would prevent changes in borrowing from offsetting the impact on reserves of open market operations, that is, of changes in NBR_0 . Under a nonpenalty rate, these changes in borrowing impair the Federal Reserve's ability to control total reserves. For example, suppose the Federal Reserve wants to bring about a decline in reserves and expects NBR_T to remain unchanged. In this case, the System reduces NBR_0 , which reduces reserves and tends to cause interest rates to rise. Under a nonpenalty rate, the rise in interest rates leads to an increase in borrowing, which offsets part or all of the impact on reserves of the decline in NBR_0 . A penalty rate would prevent the rise in borrowing so that reserves would drop by the amount of the decline in NBR_0 . This tendency for borrowing, under a nonpenalty rate, to offset the effects of open market operations is probably more significant than the tendency for borrowing to offset changes in technical factors. Thus, a penalty rate probably would improve the Federal Reserve's ability to control the supply of reserves.

A PENALTY DISCOUNT RATE AND RESERVE TARGETING

While a penalty rate probably would improve control over the supply of reserves, it may not be consistent with the reserve targeting approach to monetary control. Under this approach, the Federal Reserve estimates the level of nonborrowed reserves that is thought to

be consistent with the System's desired monetary growth rate. Then, the Federal Reserve uses open market operations to achieve the predetermined level of nonborrowed reserves.

The extent that a penalty rate is consistent with reserve targeting depends in part on the reserve accounting system that is in operation. Under the existing lagged reserve accounting system (LRA), the amount of reserves that depository institutions are required to hold during any week depends on the level of deposits they had outstanding two weeks earlier. Under a contemporaneous reserve accounting system (CRA)—which has been advocated by some in the belief that it would improve monetary control by providing a closer linkage between reserves and money—the level of required reserves for any week depends on the level of deposits outstanding during that week.

To analyze the relationship between the reserve accounting system and a penalty discount rate, it is useful first to discuss briefly the interaction of demand and supply in the market for reserves. In that market, the demand for reserves interacts with the supply of reserves to determine the level of interest rates on short-term money market instruments. In other words, changes in short-term interest rates bring about, in the market for reserves, a balance between the demand for and the supply of reserves. When demand exceeds supply, interest rates increase, which tends to cause the demand for reserves to decline and/or the supply to increase. The rise in interest rates continues until demand no longer exceeds supply. Similarly, when supply exceeds demand, interest rates tend to decline until supply and demand are in balance.

Under the LRA system currently in operation, a penalty discount rate is not consistent with reserve targeting. Since required reserves during any week are fixed at a level

related to deposits two weeks earlier, the demand for reserves in that week is not sensitive to changes in interest rates. Thus, changes in interest rates do not lead to changes in the demand for reserves.² Consequently, any imbalance between the demand for and the supply of reserves must be eliminated by changes in the supply of reserves—either in nonborrowed reserves or in borrowed reserves. Under current operating procedures, the changes occur in borrowed reserves because the Federal Reserve supplies a predetermined level of nonborrowed reserves. For example, when the demand for reserves exceeds the supply, the resulting rise in interest rates encourages banks to increase their borrowing, thereby expanding the supply of reserves.

A penalty discount rate, however, would eliminate the responsiveness of borrowing to changes in interest rates. Consequently, the supply of reserves would not be responsive to interest rates. Under these circumstances, there would be no mechanism for assuring an equilibrium in the market for reserves. For example, when the demand for reserves exceeds the supply, the resulting increases in interest rates would not lead to greater borrowing and to an increase in the supply of reserves. The imbalance in the market for reserves would lead to an indeterminate increase in interest rates. At

² Adjustments in excess reserves could, in principle, result in interest sensitivity of the demand for reserves under LRA. However, excess reserves in recent years have remained near frictional levels and have displayed little or no systematic response to changes in interest rates. Therefore, it is unlikely that adjustments in excess reserves would provide an adequate mechanism for ensuring balance between reserves supply and demand. Moreover, it is possible under LRA that required reserves would exceed nonborrowed reserves. In this case, there is in principle no adequate method for reserve adjustment even if excess reserves are responsive to interest rates. Therefore, this article focuses on adjustments in required reserves as the only practical method of ensuring balance between reserve supply and demand when the Federal Reserve closely controls the supply of reserves.

some point, the Federal Reserve would be forced to end the rise in interest rates by expanding the supply of nonborrowed reserves. Since the current procedures are based on maintaining a predetermined level of nonborrowed reserves, a penalty rate is inconsistent with the procedures under the current system of lagged reserve accounting.³ Therefore, a penalty discount rate clearly would not be desirable unless the reserve accounting system were changed to CRA.

Under CRA, a penalty discount rate is more likely to be consistent with the reserve aggregate approach to monetary control. Required reserves during any week, under CRA, are related to deposits in that week. Therefore, if the public's demand for deposits—and thus depository institutions' demand for reserves—is sensitive within a week to interest rates, any imbalance between demand and supply could potentially be eliminated by changes in the demand for reserves induced by interest rate movements. For example, when the demand for reserves exceeds the supply, the resulting rise in interest rates would encourage the public to reduce their holdings of deposits, which would in turn reduce the demand for reserves. Thus, even though a penalty discount rate would eliminate the responsiveness of the supply of reserves to changes in interest rates, contemporaneous reserve accounting may possibly provide a mechanism for assuring an

³ Presumably, the Federal Reserve would begin expanding the supply of nonborrowed reserves when the Federal funds rate increases above the upper limit of the range established by the FOMC. At this point, the Federal Reserve would, in effect, be forced to follow an interest rate rather than a reserve aggregate approach. Of course, this may occur without a penalty rate, but it would occur more often with a penalty rate. This is because, with a penalty rate and a fixed supply of nonborrowed reserves, the absence of any equilibrating mechanism would result in a very volatile Federal funds rate. The rate would tend to either increase or decrease sharply. In practice, the Federal Reserve would be forced to abandon a nonborrowed reserves target in order to keep the funds rate within its range.

equilibrium in the market for reserves. Under CRA, then, a penalty discount rate may possibly be consistent with reserve aggregate targeting.

Whether a penalty discount rate would in practice be consistent with reserve targeting depends mainly on the short-run sensitivity of the public's demand for money to changes in interest rates. If the demand for money is very responsive to interest rates, then a penalty rate would be consistent with reserve aggregate targeting. However, if money demand does not respond within a week to interest rate changes, a penalty discount rate probably would not be consistent with reserve targeting, even if the accounting system were changed to CRA.⁴

A PENALTY DISCOUNT RATE AND MONETARY CONTROL

This section analyzes the impact of a penalty discount rate on monetary control assuming that a penalty rate is consistent with reserve targeting. For these purposes, it is assumed that the Federal Reserve adopts CRA and that the demand for money responds within a week to changes in interest rates. Under these assumptions, the section analyzes whether a penalty rate would result in better control over the actual stock of money balances held by the public and thereby allow the Federal Reserve to better achieve its money stock targets. To analyze the impact of a penalty rate on

⁴ The interest elasticities of depository institutions' demand for excess reserves and of the public's demand for nonmonetary deposits would also influence the extent to which a penalty discount rate would be possible under CRA. Unfortunately, there is little evidence regarding the very short-run interest responsiveness of the public's demand for monetary and nonmonetary deposits and of depository institutions' demand for excess reserves. The available evidence suggests that the demand for reserves is unlikely to be very responsive to interest rates within a period of time as short as a week. See Helen T. Farr, Steven M. Roberts, and Thomas D. Thompson, "A Weekly Money Market Model," Special Studies Paper No. 86 from the Board of Governors of the Federal Reserve System.

monetary control, it is helpful to identify the factors that determine the stock of money and to show how the Federal Reserve acts to maintain the money stock in line with targeted levels.

The stock of money is determined by the demand for money—that is, the amount of money the public wants to hold—and by the supply of money—the amount of money balances depository institutions are willing to provide. The amount of money demanded by the public depends primarily on the levels of interest rates and income. For example, an increase in income or a decline in interest rates leads to an increase in the demand for money. The amount of money depository institutions are willing to provide depends on the amount of reserves available to support monetary deposits. Thus, the supply of money depends positively on the total supply of reserves, TR^S , and negatively on the amount of reserves used for purposes other than to support monetary deposits. These purposes include both excess reserves, ER, and required reserves against nonmonetary liabilities, RR_N . The total reserve supply consists of nonborrowed reserves, NBR, plus discount window borrowing, BR. The money supply relationship may be written as:

$$M^S = f[NBR + BR - RR_N - ER].$$

In equilibrium, the amount of money the public wants to hold must be equal to the amount of money furnished by depository institutions. Changes in interest rates are the primary mechanism for ensuring balance in the short run between the demand for money and the supply of money.

The Federal Reserve affects the stock of money by affecting the supply of reserves. It does so by controlling nonborrowed reserves and establishing the discount rate. Under current procedures, the Federal Reserve estimates the level of nonborrowed reserves that will result in an actual stock of money that

equals the targeted level, then sets out to maintain the estimated level of nonborrowed reserves. In estimating the appropriate level of nonborrowed reserves, the System estimates the impact on the money stock of factors other than nonborrowed reserves—including the strength of money demand as well as the prospective behavior of discount window borrowing, excess reserves, and reserves used to support nonmonetary liabilities. If these estimates are accurate, the monetary authorities will be successful in achieving the money stock targets. However, unexpected changes in the demand for money or in ER and RR_N will lead to a divergence between the actual and targeted money stock.⁵

Whether or not a penalty discount rate potentially would improve monetary control depends on the relative significance, in terms of frequency and magnitude, of unpredicted shifts in the demand for money compared to changes in the supply of money caused by ER and RR_N . A penalty rate would not improve monetary control if unpredicted changes in ER and RR_N factors are more important than are unpredicted changes in money demand.

As indicated, such changes in ER and RR_N cause the stock of money to deviate from the level targeted by the Federal Reserve. Under a nonpenalty discount rate, however, changes in ER and RR_N give rise to changes in borrowing. The changes in borrowing partly offset the impact on the money supply of the changes in these two factors, reducing the extent that the money stock deviates from targeted levels. Under a penalty discount rate, however, changes in borrowing would not occur in

⁵ It is assumed, for simplicity, that the Federal Reserve can precisely predict the relationship between discount window borrowing and the spread between market interest rates and the discount rate. If this were not so, variability in the “borrowing function” could also impair the Federal Reserve’s ability to achieve its monetary objectives.

response to changes in ER and RR_N . Under a penalty rate compared to a nonpenalty rate, then, the money stock would deviate from targeted levels by a greater amount in response to unexpected changes in excess reserves and reserves used to support nonmonetary liabilities.

For example, suppose there is an unexpected increase in the demand for excess reserves. This would lead to a decline in the supply of money, which would be accompanied by an increase in interest rates. Under a nonpenalty discount rate, part of the impact on the supply of money of the increase in the demand for excess reserves would be offset by a rise in borrowed reserves because banks tend to borrow more as interest rates increase. However, under a penalty rate, borrowing would not increase, and none of the impact on the supply of money of the rise in excess reserves would be offset.

A penalty discount rate would improve monetary control if unpredicted shifts in the demand for money are more important than changes in money supply factors (ER and RR_N) in causing the money stock to diverge from targeted levels. Unpredicted changes in the demand for money are likely to cause larger deviations under a nonpenalty rate than under a penalty rate. This is because a change in the demand for money under a nonpenalty rate leads to a change in borrowing and therefore in the supply of reserves and money. Under a penalty rate, though, a change in monetary demand does not bring about a change in borrowing.

For example, suppose there is an unexpected increase in the demand for money. The rise in the demand for money would lead to an increase in interest rates. Under a nonpenalty discount rate, the increase in interest rates would encourage depository institutions to increase their borrowing. The greater supply of borrowed reserves would lead to a rise in the stock of money. However, under a penalty

discount rate, borrowing would not increase in response to the increase in interest rates. Thus, there would be no rise in the supply of reserves or in the stock of money.

A PENALTY DISCOUNT RATE AND INTEREST RATE VOLATILITY

The analysis in the preceding sections has shown that a penalty discount rate would improve monetary control under a reserve aggregate approach if certain conditions are met. First, the System would be required to institute CRA to ensure that there is some mechanism for balancing the supply of and the demand for reserves. Second, technical market factors affecting reserves need to be predictable enough that the Federal Reserve is able to control nonborrowed reserves through open market operations. Third, unexpected shifts in the demand for money are required to be more pronounced in their impact on the money stock than are unanticipated changes in factors affecting the supply of money.⁶ A final condition is that the demand for money would have to respond within a week to changes in interest rates.

Even if these conditions were met, however, a penalty discount rate may not be desirable. This is because a penalty rate would increase the short-run volatility of interest rates. When the supply of money does not respond to changes in interest rates, as it would not under a penalty rate, changes in the demand for money lead to relatively larger changes in interest rates. Moreover, the smaller the interest rate sensitivity of demand, the greater the volatility of interest rates. Thus, even if demand is somewhat sensitive to interest rate changes, the

⁶ It is important to note that if factors affecting the money supply are more important than money demand shifts, the reserves approach to monetary control may not be appropriate. See J. L. Pierce and T. D. Thompson, "Some Issues in Controlling the Stock of Money," in *Controlling Monetary Aggregates II: The Implementation*, Federal Reserve Bank of Boston, September 1972, pp. 115-37.

introduction of a penalty rate may sharply increase the short-run volatility of interest rates. The adverse impact of this volatility on the economy may outweigh the improvement in monetary control that a penalty discount rate would produce.⁷

While a penalty rate may result in unacceptable interest rate volatility, it might be possible to change the system for administering the discount rate to improve the Federal Reserve's control over reserves and money. In particular, the beneficial monetary control results from reduced variability in discount window borrowing would require more rapid and timely adjustments in the discount rate than have taken place under current arrangements. A system possibly could be designed that would allow the discount rate to change with market interest rates within a specified range or with a set time lag. For example, the discount rate could be determined by a formula based on the average level of the Federal funds rate over a specified number of previous weeks. This formula could be altered from time to time, or temporarily suspended as events warranted. Alternatively, a surcharge on

discount window borrowing, similar to the one that is now in effect, could be made permanent and maintained at a penalty level. Either of these alternatives would be consistent with reserve targeting whether or not contemporaneous reserve accounting is adopted. Moreover, either alternative would probably improve the Federal Reserve's ability to control the stock of money while resulting in less volatility in interest rates than would a pure penalty discount rate.

CONCLUSIONS

The argument that a penalty discount rate is needed to achieve adequate monetary control under a reserve aggregate approach to policy implementation has been analyzed in this article. The analysis suggests that a penalty rate would probably improve the Federal Reserve's ability to control the supply of reserves because it would reduce the variability of reserves supplied through the discount window. However, improved control of the supply of reserves would not improve monetary control so long as the existing lagged reserve accounting system is retained. Indeed, a penalty rate is fundamentally inconsistent with reserve targeting under lagged reserve accounting. If a contemporaneous reserve accounting system were adopted, the improved control over the supply of reserves resulting from a penalty rate might increase the potential degree of short-run monetary control exercised by the Federal Reserve. However, a change to contemporaneous reserve accounting and a penalty discount rate would substantially increase interest rate volatility and might result in unacceptable disruptions in both the financial and real sectors of the economy. Therefore, a penalty discount rate might be inadvisable even if the Federal Reserve adopts contemporaneous reserve accounting.

⁷ It should be noted again that the discussion in this section assumes that contemporaneous reserve accounting is in effect. The reserve accounting system also has implications for interest rate variability. In some cases, a shift to CRA without the adoption of a penalty discount rate would result in an increase in interest rate volatility. For a discussion of the costs of interest rate volatility, see R. Lombra and F. Struble, "Monetary Aggregate Targets and the Volatility of Interest Rates: A Taxonomic Discussion," *Journal of Money, Credit, and Banking*, Vol. 11, No. 3, August 1979, pp. 284-300. An empirical analysis of the implications of the reserve accounting system for monetary control can be found in J. A. Cacy, Bryon Higgins, and Gordon H. Sellon, Jr., "Control Over Reserves and Money Under Contemporaneous and Lagged Reserve Accounting," Research Working Paper 80-05, Federal Reserve Bank of Kansas City, August 1980.

The Tenth District and National Business Cycles

By Dale N. Allman

How great is the impact of a national business cycle on the economies of the states of the Tenth Federal Reserve District? This question, of the comparative strength of the Tenth District economy during business cycles, is important again at the beginning of 1981, following a year which included both the end of a long business cycle expansion and—perhaps—the end of the shortest recession of the post-World War II era.

The purpose of this article is to examine how sensitive the economies of the Tenth District states were to national business cycles in the decades of the 1960s and 1970s, and to see how they fared in the very sharp downturn of early 1980.

In order to determine the responsiveness of the Tenth District and its individual states to national business cycles, the rates of growth in their economic activity are compared to the national growth rate. Such comparisons are used to show the extent to which the states responded to, or participated in, national

recessions and recoveries, and are not intended to represent state or regional business cycles as such.

Income growth is used as the measure of economic activity in this article because broader measures of economic activity such as gross product, or output, are not available on a state-by-state basis. More specifically, wage and salary income and proprietors' income in the nonfarm sector (hereafter called "nonfarm earnings") is the indicator used in the analysis. Sources of personal income other than nonfarm earnings are excluded because fluctuations in it often occur because of exogenous influences (such as changes in weather conditions) which are not directly related to the dynamics of the national business cycle. Transfer payments are excluded because they are not payments for participation in current economic activity. Property income (dividends, interest, and rent) is excluded because it is not clearly assignable to subnational geographic areas—i.e., property income in a Tenth District state is not as clearly assignable to economic activity there as are wages and salaries and proprietors' income. (Nonfarm wages and salaries and proprietors' income in 1979 made up 72 per cent of total

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personal income in the seven states of the Tenth Federal Reserve District.¹ Farm income in 1979 was 5 per cent of total personal income.)

The period examined in this article, from the first quarter of 1960 through the first quarter of 1980, includes three peak-to-peak national business cycles.² In total, there were 14 quarters of recession and 67 of expansion. The three peak-to-peak cycles included are those from 1960:I to 1969:III, from 1969:III to 1973:IV, and from 1973:IV to 1980:I.

Several sets of comparisons of growth rates of nonfarm earnings in the Tenth District states with those of the nation were made in an attempt to assess the sensitivity of economic activity in those states to national business cycles. First, the average growth rates were compared for all 67 expansion periods and for all 14 recession periods. Next, growth rates were compared for each of the three completed business cycles included in the period under review. In making some of the comparisons, a simple indicator called the "cyclical swing" was used. The cyclical swing is the percentage point difference between an expansion growth rate and a recession growth rate in nonfarm earnings.

A comparison of cyclical swings shows how sensitive a particular area's economy has been to national business cycles. An area with a swing in growth rates from recession to expansion that is larger than the nation's swing is identified as cyclically sensitive. Conversely, a swing smaller than the nation's identifies an

area as relatively insensitive to the national cycle.

A number of reasons may exist for states and regions to have different degrees of sensitivity to national business cycles. One of the most important is that of different industrial structures producing different output mixes. Such differences in industrial structure between the United States and the Tenth District will be discussed here.

AVERAGE DISTRICT SENSITIVITY

The average response of the Tenth District economy over the entire 81-quarter period to national business cycles will be examined in this section. First, nonfarm earnings growth in the District will be compared to national growth during the separate phases of the cycle. Next, the average change in growth rates over the complete cycle, the cyclical swing, will be compared to the national change. These comparisons will permit some conclusions about the average sensitivity of economic activity in the Tenth District to national recessions and expansion during the 1960s and 1970s. The average growth rates of nonfarm earnings during the last three national expansions and recessions for the United States, the Tenth District, and the individual states in the District are presented in Table 1, as are the cyclical swings in nonfarm earnings growth during the last three complete business cycles.

Expansion Growth Rates

During the last three national expansions, the average annual growth rate of nonfarm earnings was about the same in the United States (8.8 per cent) and in the Tenth District (8.9 per cent). For the individual states in the District, the average growth rates of nonfarm earnings during national expansions were within 1 percentage point of the national average in five of the seven states (Missouri,

¹ The Tenth Federal Reserve District includes Nebraska, Kansas, Wyoming, Colorado, and parts of Missouri, Oklahoma, and New Mexico.

² Cyclical peaks and troughs in national economic activity are identified here by peaks and troughs in Gross National Product in 1972 dollars. For example, the second quarter of 1975 is identified as the initial quarter of the most recently ended expansion, and the first quarter of 1980 is identified as its final quarter.

Table 1

NONFARM LABOR AND PROPRIETORS' INCOME: AVERAGE QUARTERLY PER CENT CHANGE, AT ANNUAL RATES

1960:1 to 1980:1

	<u>Expansions</u>	<u>Recessions</u>	<u>Cyclical Swing</u>
United States	8.8	5.2	3.6
Tenth District	8.9	6.7	2.2
Missouri	8.1	4.8	3.3
Kansas	8.6	6.3	2.3
Colorado	10.7	8.6	2.1
New Mexico	9.1	7.3	1.8
Oklahoma	9.5	8.0	1.5
Nebraska	8.2	7.9	0.3
Wyoming	10.2	10.9	-0.7

SOURCE: Unpublished income data, Bureau of Economic Analysis, U.S. Department of Commerce.

Nebraska, Kansas, New Mexico, and Oklahoma). In those states, nonfarm earnings growth during expansions ranged from 8.1 per cent in Missouri to 9.5 per cent in Oklahoma. Nonfarm earnings in the two remaining states, Colorado and Wyoming, grew at an average annual rate of more than 10 per cent during national expansions in the 1960s and 1970s.

In the expansion phases of the last three national business cycles, therefore, nonfarm earnings in Tenth District states increased at an average rate close to or above that of the United States. But how does economic activity in the District respond to national recessions?

Recession Growth Rates

The average growth rates of nonfarm earnings during national recessions indicate

that economic activity in the Tenth District and in the individual states in the District did not slow as much as in the nation. In the Tenth District, nonfarm earnings grew during recessions at an average growth rate of 6.7 per cent, compared to 5.2 per cent in the United States (Table 1). The average recession growth rate of nonfarm earnings in all District states except Missouri was also greater than in the nation. Missouri nonfarm earnings grew at an average annual rate of 4.8 per cent, a growth rate only slightly smaller than the national rate. In the other six District states, growth ranged from 6.3 per cent in Kansas to 10.9 per cent in Wyoming. This comparison of growth rates of nonfarm earnings during the last three national recessions indicates that economic activity in the Tenth District and in most District states was less affected by national recessions than other areas of the country.

Cyclical Swing

The cyclical swing in nonfarm earnings growth—the difference between the average growth rate in expansions and the average growth rate in recessions—amounted to 3.6 percentage points in the last three business cycles in the United States (Table 1). The Tenth District cyclical swing was 2.2 per cent in the last three business cycles, smaller than in the nation. The District state with the largest difference in average growth rates was Missouri, whose cyclical swing of 3.3 was only slightly less than that of the United States. The other six District states had cyclical swings considerably smaller than the national cyclical swing. Wyoming actually had a negative cyclical swing in nonfarm earnings growth rates, indicating that the average recession growth rate was greater than the average expansion growth rate in that state during the 1960s and 1970s.

In brief, during the last three national business cycles, the average growth of nonfarm

earnings in the Tenth District and District states has been similar to that of the United States in expansion phases of the cycle. In the recession phases of the cycle, nonfarm earnings in the District grew at an average rate faster than in the nation. The higher average growth rate during recessions suggests that the economies of the Tenth District and most District states have not been very responsive to national recessions. Also, for the Tenth District as a whole, the cyclical swing in earnings growth rates was well below the national average, indicating that the District was relatively insensitive to the last three business cycles.

DISTRICT RESPONSE TO INDIVIDUAL CYCLES

The preceding comparisons between expansion growth rates and recession growth rates of nonfarm earnings used average rates for the last three national cycles as a whole. The resulting cyclical swings indicated that the Tenth District and six of the seven states in the District were on average relatively insensitive to national cycles. How did the District respond to each of those three cycles individually? Are there differences in response from cycle to cycle? To answer these questions, the same type of comparison between expansion growth rates and recession growth rates can be made for each individual business cycle. More specifically, the cyclical swing in the Tenth District and District states can be evaluated relative to the national cyclical swing in each of the three cycles, and that relationship between cyclical swings can then be used to identify the sensitivity of the District to those individual cycles,

The 1960s

The peaks and troughs in real GNP establish the first national cycle in the period, beginning

in the first quarter of 1960 and ending in the third quarter of 1969 and spanning 39 quarters of economic activity. Table 2 presents the growth rates of nonfarm earnings during the 35 quarters of expansion and the 4 quarters of recession included in that business cycle.

In the expansion phase of the 1960s business cycle, the growth of nonfarm earnings in the United States was slightly more than 7 per cent at an annual rate. The Tenth District expansion growth rate was slightly less than 7 per cent. Among District states, only Colorado and Oklahoma grew at a rate equal to or greater than that of the United States. Nonfarm

Table 2

NONFARM LABOR AND PROPRIETORS' INCOME: AVERAGE QUARTERLY PER CENT CHANGE, AT ANNUAL RATES

1960:I to 1969:III

	Expansion 1960:IV- 1969:III	Recession 1960:I- 1960:IV	Cyclical Swing
United States	7.3	2.2	5.1
Tenth District	6.8	3.0	3.8
Colorado	7.7	5.4	2.3
Kansas	6.2	2.3	3.9
Missouri	7.0	1.8	5.2
Nebraska	6.4	6.8	-0.4
New Mexico	5.4	1.8	3.6
Oklahoma	7.3	2.1	5.2
Wyoming	4.7	3.2	1.5

SOURCE: Unpublished income data, Bureau of Economic Analysis, U.S. Department of Commerce.

earnings in the remaining District states grew during that expansion at a rate smaller than the national rate. The District response to the expansion phase of the 1960s cycle was thus different from the average response to all three business cycles in that the growth rate of nonfarm earnings in most District states was slightly less than in the United States.

During the recession quarters of the 1960s cycle, the growth of nonfarm earnings in the nation slowed to slightly more than 2 per cent at an annual rate. Nonfarm earnings growth in the Tenth District in that recession slowed to a rate of only 3 per cent. The recession growth rates of nonfarm earnings in Oklahoma, New Mexico, and Missouri were slightly less than in the nation. In the other four District states, the growth rate in the 1960s recession was greater than the national growth rate. Thus, the response to the recession phase of the 1960s cycle was also somewhat different from the average response to all cycles in that there were three District states with recessions growth rates below the national rate.

In the 1960s business cycle, the cyclical swing in the nation's nonfarm earnings growth amounted to 5.1 percentage points. The change in growth rates during the 1960s cycle in the Tenth District, which amounted to a cyclical swing of 3.8 per cent, was 1.3 percentage points less than in the nation. Among District states, Oklahoma and Missouri had cyclical swings about equal to the nation; all other District states had cyclical swings less than the United States swing. (Nebraska's cyclical swing in the 1960s cycle was negative, as nonfarm earnings in that state grew at a slightly faster rate during the recession than the expansion.)

On the basis of cyclical swings, Oklahoma and Missouri can be classified as being relatively sensitive to the 1960s business cycle. The economies of the other five states, and of the Tenth District as a whole, were relatively insensitive to the 1960s cycle.

The 1970s

Tables 3 and 4 present similar expansion and recession growth rates and cyclical swings for the two business cycles that occurred during the 1970s. During the 13 quarters of expansion in the cycle that began in the third quarter of 1969 and ended in the fourth quarter of 1973, nonfarm earnings grew at an annual rate of about 9 per cent in the United States. The growth rate during the six quarters of recession in the early 1970s was a little more than 5 per cent. For that business cycle, the United States cyclical swing was 3.8 percentage points. The Tenth District economy was relatively insensitive to the cycle of the early 1970s, as

Table 3

NONFARM LABOR AND PROPRIETORS' INCOME: AVERAGE QUARTERLY PER CENT CHANGE, AT ANNUAL RATES

1969:III to 1973:IV

	Expansion 1970:IV- 1973:IV	Reces- sion 1969:III- 1970:IV	Cyclical Swing
United States	9.1	5.3	3.8
Tenth District	9.7	7.0	2.7
Colorado	13.7	10.8	2.9
Kansas	9.8	4.4	5.4
Missouri	7.6	6.1	1.5
Nebraska	9.4	7.0	2.4
New Mexico	11.1	6.5	4.6
Oklahoma	9.3	7.8	1.5
Wyoming	13.3	6.6	6.7

SOURCE: Unpublished income data, Bureau of Economic Analysis, U.S. Department of Commerce.

shown by a Tenth District cyclical swing of only 2.7 percentage points.

The expansion growth rates of nonfarm earnings in the early 1970s were greater than the national rate in all District states except Missouri. Missouri nonfarm earnings, however, grew faster than the national rate during the recession of the early 1970s. In that recession, Kansas was the only District state whose growth in nonfarm earnings was below the national rate. As a result, the Kansas economy responded to the early 1970s cycle with a cyclical swing greater than that of the United States. The cyclical swings in Wyoming and New Mexico were also greater than the nation's, even though the expansion and

recession growth rates were both above the national growth rates in both states. The Tenth District as a whole and the remaining four District states (Colorado, Nebraska, Missouri, and Oklahoma) all had swings less than the United States, suggesting that those areas did not respond to the early 1970s cycle as much as did Wyoming, Kansas, and New Mexico.

The business cycle that occurred in the latter part of the 1970s began in the fourth quarter of 1973 and ended in the first quarter of 1980. During the 21 quarters of expansion in that cycle, the growth of nonfarm earnings in the United States was 11 per cent at an annual rate. In the six recession quarters, nonfarm earnings grew at a 7 per cent rate in the nation, resulting in a cyclical swing of 4 percentage points. Among Tenth District states, the response to the late 1970s cycle was greatest in Missouri and Colorado, where the cyclical swing was greater than in the United States. The nature of the cyclical swing differed in those two states, however. The expansion and recession growth rates were both greater than the national growth rates in Colorado, but in Missouri they were both less than the national rates.

The Tenth District as a whole and the other five District states had cyclical swings less than in the United States during the late 1970s business cycle. In all of those areas except Nebraska, the expansion growth rate of nonfarm earnings was greater than in the nation, while the recession growth rates were greater than nationally in all areas.

Although the District response to the three individual business cycles in the 1960s and the 1970s varied from cycle to cycle and from area to area, some generalizations may be made. First, the Tenth District as a whole was relatively insensitive to all three business cycles: the District's cyclical swing in each cycle was less than that of the United States. In both cycles of the 1970s, Tenth District nonfarm earnings outpaced U.S. growth in both the

Table 4

NONFARM LABOR AND PROPRIETORS' INCOME: AVERAGE QUARTERLY PER CENT CHANGE, AT ANNUAL RATES

1973:IV to 1980:I

	Expan- sion 1975:I- 1980:I	Reces- sion 1973:IV- 1975:I	Cyclical Swing
United States	11.0	7.0	4.0
Tenth District	12.2	9.0	3.2
Colorado	13.8	8.6	5.2
Kansas	12.0	10.8	1.2
Missouri	10.3	5.6	4.7
Nebraska	10.5	9.5	1.0
New Mexico	14.0	11.6	2.4
Oklahoma	13.4	12.0	1.4
Wyoming	17.7	20.2	-2.5

SOURCE: Unpublished income data, Bureau of Economic Analysis, U.S. Department of Commerce.

expansion and the recession phases. In the 1960s, Tenth District nonfarm earnings grew faster than the nation's during recession, and very nearly kept pace during the expansion phase. Second, Nebraska is the only state in the District that was similarly insensitive to all of the last three national business cycles. Third, Missouri was the only District state that was relatively sensitive to more than one of the three individual cycles, i.e., Missouri's cyclical swing was greater than the nation's in two of the three cycles. Finally, only a small minority of District states failed to keep pace with national earnings growth in either the expansion or recession phases of both cycles of the 1970s. A slightly larger group of states fell behind the national pace in both the expansion and the recession of the 1960s.

INDUSTRIAL STRUCTURE AND BUSINESS CYCLE RESPONSE

Variations in the effect of national business cycles on individual regions and states have been determined to depend significantly on regional variations in industrial composition.³ Regions with a large share of total earnings attributable to industries whose activity varies greatly over the business cycle are most responsive to national cyclical changes. For example, the cyclical swing has been greater in the Great Lakes states than in any other region, principally because of the greater importance there of durables manufacturing—an industry that is particularly susceptible to the ups and downs of the business cycle.

Do the Tenth District and its states have industrial structures that are less cyclically sensitive than that of the national economy?

³ Lynn E. Browne, "Regional Industry Mix and the Business Cycle," *New England Economic Review*, November/December 1978, pp. 35-53.

The most cyclically sensitive sector of the national economy is the manufacturing sector. Its average contribution to total nonfarm earnings nationally was more than 28 per cent in the 1960s and 1970s. In the Tenth District as a whole the manufacturing sector contributed a smaller share (21 per cent) to earnings than it did for the nation; the same was true for all District states but Missouri.

Mining was the least cyclically sensitive sector of the national economy in the 1960s and 1970s, followed by the government sector. Both of these sectors made up a larger share of the Tenth District economy than of the national economy. (The same was true of all District states except for Missouri and Nebraska in the case of the mining sector, and for Missouri in the case of the government sector.) Together, mining and government averaged nearly 23 per cent of total nonfarm earnings in the Tenth District, compared to about 18 per cent for the nation.

In the Tenth District as a whole, and for most District states, the relatively greater contribution to total nonfarm earnings of the least cyclically sensitive industries (mining and government), and the relatively smaller contribution of the most cyclically sensitive industry (manufacturing), help to explain the comparative insensitivity to national business cycles of the region's economy.

There may be changes over time in the sensitivity of a region to national business cycles. If such regional sensitivity depends significantly on differences in industrial structure, a region that is relatively insensitive to national cycles may become more sensitive if its industrial structure becomes more like the nation's. There has apparently been a slight tendency of that sort in the case of the Tenth District and most of its states since 1960. During that period, manufacturing earnings grew faster than the national rate in the Tenth District as a whole and in all its states save

Missouri and Wyoming. At the same time, earnings from the government sector grew more slowly in the Tenth District and in all seven of its states except Missouri. Because of these differential rates, the industrial structure of the Tenth District may be becoming more like that of the United States, and hence more cyclically sensitive over time. There does appear to be some closing of the differences in industrial composition over the last two decades, as far as the most sensitive and least sensitive industries were concerned. And at the same time, the difference in cyclical swings between the United States and the Tenth District has lessened from the cycle of the 1960s to that of the late 1970s. While these tendencies appear to be present, this analysis does not provide a clear-cut resolution of whether the Tenth District is becoming more sensitive to national business cycles.

DISTRICT RESPONSE TO THE 1980 DOWNTURN

The first quarter of 1980 was the last quarter of real GNP growth in the expansion that began in early 1975. In that quarter, U.S. nonfarm earnings grew at an annual rate of 10.6 per cent, about the same as the Tenth District growth rate of 10.9 per cent. Growth in Kansas, Missouri, and Nebraska was slower than the national rate, while in Oklahoma earnings grew only slightly faster than for the nation. The District's three mountain states, however, posted earnings growth from about 2.5 to nearly 12 percentage points greater than the nation (Table 5).

The second quarter of 1980 brought the largest post-World War II decline in real GNP—a 9.9 per cent annual rate. U.S. nonfarm earnings growth also was off sharply, increasing (in nominal terms) at a 1.5 per cent annual rate. Earnings growth for the District also was off sharply as a result of the recession but, at a 2.9 per cent rate, remained slightly

greater than for the United States. The range of state rates of earning growth was very wide in the recessionary second quarter—from small declines in Kansas and Missouri to an increase in Oklahoma greater than that state achieved in the first quarter of the year.

The Tenth District as a whole apparently was still relatively insensitive to national recession in the second quarter of 1980, as indicated by a comparison of growth in nonfarm earnings. But nominal declines occurred in Kansas and Missouri, suggesting perhaps a sharper reaction to the national downturn. At the same time, the remaining five District states showed earnings growth faster than the United States, with growth in New Mexico, Wyoming, and Oklahoma considerably faster. Yet second

Table 5

NONFARM LABOR AND PROPRIETORS' INCOME: AVERAGE QUARTERLY PER CENT CHANGE, AT ANNUAL RATES

	1980:I	1980:II	Cyclical Swing
United States	10.6	1.5	9.1
Tenth District	10.9	2.9	8.0
Colorado	15.8	2.0	13.8
Kansas	7.7	-0.3	8.0
Missouri	8.4	-1.0	9.4
Nebraska	7.8	3.5	4.3
New Mexico	13.0	6.3	6.7
Oklahoma	11.0	11.3	-0.3
Wyoming	22.4	6.7	15.7

SOURCE: Unpublished income data, Bureau of Economic Analysis, U.S. Department of Commerce.

quarter growth in the three mountain states was significantly slower than in the first quarter, indicating that—compared to their own earlier record—a reduced pace of economic activity was also felt there.

SUMMARY

Comparisons of growth rates in nonfarm earnings support the view that economic activity in the Tenth District was relatively insensitive to national business cycles during

the 1960s and 1970s. This comparative insensitivity to national expansions and recessions is at least partly explained by an industrial structure in the Tenth District that is more weighted toward mining and government, and less toward manufacturing, than is the U.S. economy. While the District certainly felt the reduced pace of economic activity in the spring of 1980, it continued to be less responsive to national cyclical change than some other parts of the country.

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