

For Release on Delivery
Saturday, December 30, 1967
2 P.M., E.S.T.

PRICE MEASUREMENTS AND THE
DETERMINATION OF MONETARY POLICY

A Paper Presented
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Before the
Annual Meeting
of the
American Statistical Association

Shoreham Hotel
Washington, D. C.

December 30, 1967

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By Andrew F. Brimmer*

From the perspective of monetary management, general price indexes, measures of key variables that influence price changes, and the understanding of price changes are never adequate. In at least two critical periods in recent years--in 1955-57 and again in 1959-60--the guidance to monetary policy determination provided by the then-existent "state of the arts" of price measurement and price analysis appears to have been less than propitious:

- Based on indexes of limited scope, the analysis and interpretation of price developments in the mid-1950's led the Federal Reserve System to believe that the inflationary pressures they were trying to combat were essentially of the excess demand variety. The System's published interpretations of this experience and the monetary policies adopted were consistent with a "demand-pull" conception of the inflationary process.
- However, with the subsequent improvement of both price measures and analytic technique and their application to historical data, it now seems evident that the price developments of the mid-1950's contained a much stronger element of "cost-push" inflation than was then recognized. Thus, the question is posed: Were stabilization policies in the mid-1950's based on monetary and fiscal--as opposed to specialized--measures designed properly to achieve an optimum combination of restraint on prices while permitting the maximum growth of output and employment?

*Member, Board of Governors of the Federal Reserve System. I am grateful for the assistance of several members of the Board's staff in the preparation of this paper. I must mention specifically Lorman C. Trueblood, Alexander Yeats, Lyn McWhirter and Mary Ann Graves.

- During the recession of 1957-58, the general level of prices, whether defined in terms of the consumer price index or the wholesale price index, rose further--despite the decline in output and employment. This behavior of prices supported the view of a basic persistence of inflationary expectations. Reflecting this conclusion, monetary restraint in 1959-60 was both fast and severe--although actual price advances in these years were relatively moderate.

Again a question is raised: Did technical deficiencies in the construction of the key indexes conceal the actual behavior of prices and thus led to a less than ideal monetary policy?

Fortunately, in the last decade, considerable improvement has been made in the construction of price and related indexes, although a number of critical problems remain to be solved. Perhaps of even more importance, the analysis and interpretation of price changes have been strengthened--not simply by the availability of more accurate and comprehensive indexes but also by the development of a more coherent framework of analysis. In turn, the ability of the monetary authorities to make appropriate policy decisions has been greatly enhanced.

- For example, with the development of inflationary pressures in 1965-66 as military activity in Vietnam accelerated, the Federal Reserve System recognized--correctly--that these pressures were being generated primarily by over-all conditions of excess demand. This clearly called for a policy of general monetary restraint. However, because of the desire for a more balanced impact of restraint (i.e., moderating a boom in inventory accumulation and in plant and equipment spending while avoiding disproportionate effects on housing), numerous officials in the System also advocated a program of vigorous fiscal restraint in 1965-66. Moreover, there was considerable innovation in the use of policy instruments in an effort to focus the impact of restraint more sharply on the principal sectors in which inflationary pressures centered.

-- Since mid-1967, we have been faced with renewed inflationary pressures. This time, however, a substantial share of the pressure on prices can be identified clearly as of the "cost-push" variety--stemming from sharply rising unit labor costs from mid-1966 on. But the widely-held expectations of an acceleration in economic activity in late 1967 and early 1968 have also helped to create an environment hospitable to price increases. Under these circumstances, the type of stabilization policies required is also clear: the situation calls for a judicious mix of fiscal and monetary measures--with fiscal restraint--particularly a tax increase--carrying a greater share of the burden of restraint.

The contribution of Federal Reserve economists to this improved support for monetary policy has not been limited to more sophisticated use of better measures of prices and related variables developed by others. On the contrary, in an effort to strengthen the technical underpinnings on which policy must rest, System personnel have themselves made significant independent contributions to the kit of analytical tools employed rather widely--both within and outside the Government--in the study and interpretation of price developments within an aggregative framework which allows a comprehensive assessment of the performance of the national economy as a whole. These fundamental research efforts on the part of the Federal Reserve staff are not only continuing--they are being intensified.

Since reasonable price stability is one objective of monetary policy, what price measure or measures are most relevant for the determination of policy: the consumer price index? The wholesale price index? The industrial commodity price index? The sensitive industrial materials price index? In January, 1965, the Federal Reserve Board established a Committee on Prices and Price Measurement, noting that:

"Undoubtedly, price measures at each of these levels play a role in the understanding of economic developments and in the framing of policy. But it is not at all clear that any of the existing indexes measure the concepts that would be most appropriate for interpreting developments from the viewpoint of monetary policy and for policy guidance to the monetary authorities.

"Even if it were determined that existing indexes are conceptually relevant, or the best that can in practice be measured, serious questions have been raised as to their accuracy. These questions relate to variations of transactions prices around list prices as well as to the measurement of quality change and to appropriate weights."

In the closing section of this paper, I shall comment further on the work of this Price Committee and on the Federal Reserve Board's plans to quicken our efforts in this field.

Price Measurements and Monetary Policy: 1955-57

For policy-makers (as well as for others concerned with the measurement, assessment, and understanding of price changes) the years 1955-57 were a seminal period. A review of the record of Federal Reserve staff analyses of the current economic situation over that period (in addition to a study of the published record of Board and Federal Open Market Committee (FOMC) policy actions and the latter's published

minutes) casts considerable light on the problems relating to prices which the System had to face.^{1/}

One of the major issues was the question of the relative importance to be accorded to the various price indexes. In particular, what was the "general price level" most relevant for policy goals? It should be kept in mind that, in the 1955-57 period, we had available the Bureau of Labor Statistics' (BLS) wholesale (WPI) and consumer (CPI) price indexes as then constituted. Updating of weights, expansion of items covered, extension of efforts to measure quality change, improvements in other measurement methods--all of these have been incorporated in the WPI and CPI since that period. Specifically, we did not have the now-familiar, quarterly GNP implicit price indexes. (These were developed in connection with the 1958 revision of the national income accounts and first published in the Survey of Current Business in December of that year).

^{1/} These problems have been examined in great detail on the basis of published information. See: the Joint Economic Committee's voluminous study, Employment, Growth and Price Levels, 1959-60; the National Bureau of Economic Research, The Price Statistics of the Federal Government, (George J. Stigler, Chairman), 1961; Commission on Money and Credit, Money and Credit: Their Influence on Jobs, Prices, and Growth, 1961; Ibid: The Federal Reserve and the Treasury: Answers to Questions from the Commission on Money and Credit, 1963.

In the mid-1950's, the Federal Reserve System apparently took the CPI to represent the "general price level," although there is no record of an explicit decision to adopt the maintenance of stability in this measure as the principal objective of monetary policy. A nice problem at that time was the proper weight to be attached to agricultural price developments and their influences on the over-all price indexes. The sharp downtrend in prices of goods and foodstuffs during 1954 and 1955 played a major role in keeping the CPI virtually stable until April, 1956. In staff briefings for the FOMC, however, considerable emphasis (perhaps primary emphasis) was placed on industrial price developments. (For example, in late October, 1955, the staff noted ". . . widespread advances in industrial prices. . .," the industrial component of the WPI having turned up sharply beginning in July.) Nevertheless, the total WPI showed only a modest upturn by the end of 1955, as the declines in agricultural prices just about offset advances in prices of industrial commodities.

These divergent price trends led some members of the FOMC to wonder--through the first half of 1955--whether the economy had really recovered fully from the recession which began in mid-1953. This uncertainty about the vigor and sustainability of economic activity led to some groping for an agreed course of action, although some tightening was signalled by a boost in the discount rate at Federal Reserve Banks from 1-1/2 to 1-3/4 per cent in mid-April.

In early August, the FOMC adopted a policy of ". . . restraining inflationary developments in the interest of sustainable economic growth . . .". According to the policy record for the meeting, "The Committee believed that, with increased costs pushing upward on industrial prices, the general price level might well move upward with

accompanying speculative increases in inventories." A few days later, the discount rate at Federal Reserve Banks was increased from 1-3/4 to 2 per cent--and raised again to 2-1/4 per cent near the end of August and to 2-1/2 per cent in November.

It should be noted that this shift in monetary policy occurred despite the stability in the general price level whether measured by either the WPI or CPI. Undoubtedly, the sharp increases in industrial prices (reinforced by indications of "speculative psychology" as evidenced in rapid increases in common stock prices and farm land values) helped persuade the monetary authorities to shift from a posture of ease to one of restraint.

It should also be remembered that the unemployment rate averaged over 4.5 per cent in the first half of 1955, compared with 5.5 per cent in 1954 and about 3.0 per cent in 1953. Until May, 1955, industrial production was also below the 1953 peak. Thus, the question must necessarily be asked: was a policy of general monetary restraint called for and in particular how far should it have been carried in 1956 and 1957--or were special measures required to cope with the sectoral inflation then emerging? In retrospect, a number of analysts--some in the Federal Reserve System--have suggested that the latter course would have been preferable.

In the analysis and reporting of price changes in the 1955-57 period, the Federal Reserve staff focused heavily on the behavior of wholesale prices of industrial commodities. This emphasis stemmed from a variety of factors--including the recognition of the strategic role of the industrial sector in the long-term growth and cyclical behavior of the U.S. economy. Because of a long history of data collection,

there was also a greater availability of information on changes in prices, production and labor costs in the industrial sector than was the case for other segments of the economy. In the mid-to-late 1950's, the staff analysis of current industrial price developments was based mainly on the standard BLS price indexes, including the BLS daily index of 13 raw industrial materials. By early 1957, use was being made of the BLS stage-of-processing of the WPI^{1/} to make a two-way separation of the "industrial commodities" total into industrial materials and industrial products. The staff was clearly alert to the "forewarning" potentialities in the behavior of prices of selected industrial materials which are most responsive to short-run demands (in part because production of a number of them cannot be increased much--if at all--in the short-run in response to rising demands). And the price analysis performed by the staff and used in FOMC briefings in the early stages of the 1954-57 expansion focused in considerable detail on the behavior of such industrial materials.

While the record contains an abundance of descriptive material on price developments during these years, no clear-cut framework of analysis--or clearly defined conception of an inflationary process--emerges from it. Instead, as one examines the record, there unfolds a

^{1/} See "Wholesale Prices and Price indexes, 1954-56," BLS Bulletin, No. 1214.

rich tapestry describing American economic activity. While there is much evidence of disaggregation of global measures--including measures of prices--there is less evidence of attempts to re-assemble the various elements into an over-all framework for the guidance of monetary policy. This latter development apparently did not come about until the early 1960's.

Price Measurements and Monetary Policy: 1957-59

Again, in 1957-59, the question was raised as to whether the wholesale industrial price index provided an accurate tracing of the actual course of prices. Since the index is so heavily dependent on list prices, it is likely that it failed to catch completely (probable) declines in transactions prices during the 1958-59 recession. (Conversely, for the same reason, the WPI may have been slow in rising at the beginning of the 1954-57 expansion period).

In any case, during the 1957-58 recession, there was a persistent upward creep in wholesale prices of industrial commodities until January, 1958. The WPI for industrial commodities finally declined somewhat during the first half of 1958, but meanwhile prices of farm products and foods rose sharply. Thus, over the 1957-58 recession period, both the WPI and CPI increased moderately further--while total output and employment declined.

These divergent trends between prices and real economic activity generated considerable concern within the Federal Reserve System. As recessionary trends appeared on the horizon, monetary policy moved in a counter-cyclical direction in November, 1967. From then until the early summer of 1958, System policy instruments were used in a complementary manner to achieve ease in credit markets and to encourage the expansion of bank credit and the money supply. There were four reductions in Federal Reserve Bank discount rates (from 3-1/2 to 1-3/4 per cent); three reductions in reserve requirements (freeing about \$1.5 billion of required reserves), and continuing open market operations (which supplied \$2 billion of reserves to the commercial banks).

However, the persistent increases in both the WPI and CPI--combined with the sharp advances in the volume of credit in the stock market and in stock prices--by early summer caused a number of Federal Reserve officials to advocate a shift to a policy of restraint. On August 4, 1958, margin requirements were raised from 50 per cent to 70 per cent. Ten days later, the discount rate was raised from 1-3/4 per cent to 2 per cent. In October, margin requirements were raised again to 90 per cent, and the discount rate was lifted to 2-1/2 per cent. Beginning in August, open market operations were used continuously to re-inforce the lessened availability of bank reserves. In the final meeting of the year, the FOMC moved explicitly to a policy of restraint (with only one member voting against such a step on the

grounds that restraint was premature at this stage of the recovery from the 1957-58 recession). Throughout 1959, monetary restraint was followed with vigor; the discount rate was raised three times (in March, May, and September) to a level of 4 per cent.

When the shift to restraint occurred in August, 1958, unemployment was 7.4 per cent, having averaged 5.5 per cent since the pre-recession low of 3.7 per cent was attained in March, 1957. In fact, between March, 1957, and February, 1960, unemployment averaged around 5.5 per cent, compared with an average of 4.3 per cent in 1957.

Price advances during the 1959-60 period were actually relatively moderate. In 1959, the WPI was essentially unchanged from 1958 (during which the index rose by 1.4 per cent), and the 1960 index was about the same as that for the preceding year. In fact, from mid-1958 to mid-1959, among industrial commodities, only the Federal Reserve index for sensitive materials rose sharply. And this index (consisting of materials such as textile fibers and fabrics, hides, rubber, lumber, and nonferrous metals) subsequently declined equally as sharply during the 1960-61 recession. In contrast, the index for nonsensitive materials (accounting for three-fourths of the total industrial materials in the WPI) showed only a slight updrift during 1959-60.

Thus, the behavior of wholesale prices during the years 1957-60 put into sharp focus an important question for monetary policy. A substantial proportion of nonsensitive industrial materials is produced in industries in which prices are set on an "administered" basis.

In these industries, transactions prices (the prices at which commodities are actually traded) frequently diverge substantially from the list or posted prices which are recorded in the WPI. During periods of declining demand, producers may offer concessions from list prices without changing the latter. During periods of expanding demand, the supply of these nonsensitive materials can usually be increased considerably in the short-run until a fairly high capacity utilization rate is attained. Until this point is reached, a rise in demand for these materials can normally be met without an accompanying increase in costs--and, therefore, in list prices and in the WPI. On the other hand, if costs increase, list prices as well as transactions prices may be revised upward in the face of weak demand.

Thus, on balance, deficiencies in price indexes may have played a role in the adoption by the Federal Reserve System of a policy of monetary restraint earlier (and to pursue it more vigorously) than the underlying economic conditions actually required. As mentioned above, a number of observers (some within the Federal Reserve System) have suggested that general instruments of monetary policy may not be the most efficient way to fight inflationary pressures as exhibited in the behavior of prices for commodities produced under conditions where a considerable degree of market power can be exercised. Instead, fiscal policy--and perhaps wage-price guideposts and other specialized approaches--may be required to supplement monetary policy.

Progress in the Measurement of Prices in the Last Decade

Partly in an effort to cope with questions posed in the mid-to-late-1950's, a number of strides have been made in the measurement of prices in the last decade. More importantly, these improvements in index construction have greatly enhanced our understanding of the inflationary process.

For example, with the initial publication of the quarterly GNP implicit price index (IPI) in December, 1958, a somewhat different view was presented of the behavior of the "general price level" (if, for the moment, we can treat the deflator as an approximation of this concept) in the mid-1950's. The GNP deflator was rising from late 1954 on, due mainly to sharp "price" increases in the construction and government sectors. The implicit deflator for consumption expenditures was drifting up over that period, despite the stability in the CPI through early 1956. Some of the divergence between the IPI and CPI may be attributed to technical factors--such as the rise in the IPI of the cost of materials and labor as a deflator for construction and government services. However, it is important to have a general price index which will cover construction and government services as well as the industrial and private service sectors. Construction in particular is a sector characterized by pronounced cyclical swings and a strong tendency to generate large "price" increases. This was as true in 1955-56 as it is today. But the absence of the IPI in the mid-1950's prevented both analysts and policy makers from grasping the full impact on the general

price level of price changes in the construction industry. But even today, it is still important to work on extending the scope of the present monthly indexes; this in turn will result in improvement in the IPI which is derived originally from available price data.

In 1959, the Federal Reserve developed the special groupings of BLS monthly wholesale price indexes. In these indexes, a selected group of "sensitive" industrial materials is separated from other, so-called "sluggish" materials. Sensitive materials are so classified because they are particularly demand-responsive and the Federal Reserve list is considerably broader than the BLS daily group. Sluggish materials are so classified because expansion in demands for them is accompanied for a time by rising output and supply without widespread advances in list prices. The special BLS stage-of-processing indexes are also used to separate industrial products into consumer and producer goods. The Federal Reserve staff depends heavily on this framework to analyze industrial price developments.^{1/}

The present Bureau of the Census summary index of total labor cost per unit of output in manufacturing (covering all employees and supplements as well as wages and salaries) became available in 1961.^{2/} The data on supplements to wages and salaries were added to

^{1/} See: Murray Altmann, "Price Analysis and Economic Developments," Staff Economic Studies, 1965. Also "Recent Price Developments," Federal Reserve Bulletin, November, 1967.

^{2/} See: Business Cycle Developments, 1st issue, October, 1961.

the calculation in June, 1963. Scrutiny of labor cost developments (as a price-determining influence) was conducted in the mid-to-late 1950's primarily in terms of separate changes in average hourly earnings and in output per manhour for manufacturing production workers. It will be recalled that the last half of the 1950's was a period of extraordinary growth in employment of nonproduction workers. Moreover, hourly labor compensation data for nonmanufacturing industries were even more limited then than they are today.

In the mid-1950's, information on manufacturing capacity and its utilization was relatively sparse. Consequently, Federal Reserve staff analysis was confined largely to selected major industrial materials. To overcome this handicap, the Federal Reserve monthly index of capacity and rate of utilization for a combined group of major industrial materials was developed in 1957. The corresponding Federal Reserve indexes for all manufacturing industries were developed in 1959-60. The all-manufacturing indexes were subsequently improved, and a breakdown between "primary" and "advanced" industries was developed. As finally revised and made available for publication, these indexes were described in the Federal Reserve Bulletin for November, 1966.

The Federal Reserve staff is also making an effort to explore the implications of list vs. transactions prices for the behavior of price indexes. Out of this has already come James Bennett's study ("Oligopoly Price Measurement: A Study of Alternative

Measures of Price Flexibility in the U. S. Steel Industry," 1965). Staff members are now participating in an intra-governmental agency project which--among other things--is trying to isolate differences between average unit values calculated from Census benchmark data and corresponding components of the WPI. This latter work may have some bearing on the issue of list vs. transactions prices, as well as on other price measurement problems. However, the main source of enlightenment in the list vs. transactions argument will undoubtedly be the forthcoming report by the National Bureau of Economic Research (NBER) based on its two-year study of this subject.

Establishment and Work of the Federal Reserve Board's Price Committee

Despite the noticeable strides that have been made in the last decade, the Federal Reserve Board concluded in early 1965 that it was desirable to explore *intensively* a number of conceptual and statistical questions of price measurement in relation to the analytical and policy requirements of the System. To this end, it appointed the Committee on Prices mentioned above. Professor Irving Kravis, University of Pennsylvania, was named Chairman--and also appointed a Consultant to the Board. Other members are: Dorothy Brady, University of Pennsylvania; Franklin Fisher, MIT; Zvi Griliches, University of Chicago; Lester Kellogg, Deere and Company; and Robert Lipsey, National Bureau of Economic Research. The Committee's assignment was:

- To delineate the conceptual issues as to which price measures are relevant to monetary policy.

- To recommend whatever changes in data collection and indexing techniques are needed to produce more accurate measures of the price concepts relevant for monetary policy.
- To stimulate research in the causes of price change and in the measurement of prices.

At its first meeting in April, 1965, the Committee decided to carry out its assignment by encouraging individual scholars to submit research proposals dealing with a topic on the Committee's agenda. Contacts were typically made by a member of the Committee. For approved and completed projects, the Board has offered a payment of \$1,500 to a faculty member and a somewhat lower figure to graduate students. While the Board retains publishing rights on the papers, authors may also submit them for publication elsewhere.

The Committee's progress has been less rapid than had been anticipated. Attempts by Committee members to recruit researchers were frequently frustrated. Several prospective authors first suggested that they would undertake projects but subsequently declined. By September, 1966, the following papers had been commissioned:

- Harry Johnson: The Nature of the Price Universe to be Stabilized by the Monetary Authority.

A paper concerned with the nature of the price universe that the monetary authorities should have in mind when they consider their price stabilization objectives. The analysis was not to be posed in terms of the relative importance of the price objective or trade-offs. Instead it should deal with the nature of the evils that are to be avoided and the values that are sought through the price objectives of policy.

- Kenneth Arrow: Index Numbers and the Measurement of Inflation.

A paper probing the question of whether the measurement of the value of money is primarily a problem of obtaining a good "cost of living index" or whether it extends to a larger collection of prices. The analysis would also consider some of the measurement problems relating to estimation of biases in the existing consumer price index, the timing of introduction of new products, methods for measuring the quality of services, taxes, etc.

- Franklin Fisher and Karl Shell: Problems in the Theory of Taste and Quality Change.

Two joint papers concerned with the range of problems in the theory of taste and quality change, the exploration of the similarity between production and utility theory, recent treatments of technical change, and related matters for their implications for cost of living and cost of production indexes.

- Dorothy Brady: Deflation of Series Using Price Indexes.

A paper on methodological studies relating to the use of price indexes for deflation of expenditures and for the deflation of sector input (double deflation) to yield physical volume measures of net output--specifically, the use of historical materials to appraise the impact of deflation at one level of aggregation of the value data rather than at another.

- Phoebus Dhrymes: Relation of Prices to Quality Differences.

A study to extend construction of experimental hedonic indexes to new areas, specifically to the measurement of price and quality change for capital goods. Will include a study of alternative functional forms--alternative to the linear

and semi-log forms that have been employed-- to relate price differences to specified quality differences, and a study of the stability of cross-sectionally estimated parameters for a given functional form and the implications of instability.

The Committee attempted--without success--to encourage papers in several other areas:

- A psychologist was invited to explore the application of new quantitative methods in psychology to the problem of measuring the changing cost of a constant level of satisfaction--as opposed to the present practice in the CPI of measuring the changing cost of a fixed market basket of goods and services.

- Invitations were extended for a study which would explore problems encountered in the measurement of the price of labor. Average hourly earnings (the measures currently available) are not prices in the strict sense. Their movements are affected by changes in the quality composition of labor inputs and by variations in other non-price factors. Moreover, measures should be developed to evaluate the real impact of fringe benefits.

- Another study in the area of quality change and hedonic price indexes was considered. A paper was invited on the ways in which the theory of separable utility might contribute to the theory and practice of index numbers of prices.

The Committee decided that despite its strong interest in the question of list vs. transactions prices it would not sponsor a study in this area. Instead, it thought it best to await the completion of the NBER project dealing with the subject. In addition, it felt that the Federal Reserve Board's work on steel prices would make a contribution. However, the Committee agreed to discuss its interest in the subject with the NBER team and perhaps to suggest additional sources of information.

So far, only the completed paper by Fisher and Shell and the one by Dhrymes have been submitted. Apparently, the competition of other activities for the attention of the other authors has forced them to give a lower priority to the price measurement assignments than they--and we--had initially hoped.

Efforts to Strengthen the Work on Price Measurements

From the Federal Reserve Board's point of view, however, the price measurement project still has a high priority. There is still a great need to broaden the scope and to improve the quality of measures of price change. We need these better tools to enhance our understanding of the economic forces which generate changes in prices,

and--above all--they are necessary to permit a better assessment of the impact on the price level of alternative monetary and fiscal policies.

To this end, several steps have been taken to strengthen our efforts in this field. Within a few weeks, the Board's Price Committee will launch a much broader and more systematic canvas of the academic community to encourage research workers to participate in the project on price measurement. In addition to seeking assistance to carry out the projects mentioned above for which no commissions have been let, two other studies will be added--dealing with wage-price relationships and short-run price forecasting. The Committee will also ask to be informed of research projects relating to price measurement the initiation of which may be facilitated by financial assistance from the Board.

While the Price Committee will continue to assist the Board's staff in the conduct of the project, steps have also been taken to involve the staff more directly in the work on price measurement. A member of the Board's staff (Alexander Yeats) has been named Secretary to the Committee. He will assist the Committee Chairman in the coordination of the project and to ensure that the commissioning, scheduling, and reviewing of papers will operate smoothly.

In the meantime, the Board's own continuing research efforts to support the determination of monetary policy have been strengthened with respect to the study of price behavior. A new Special Studies

section (under Frank deLeeuw) has been established in the Division of Research and Statistics. The functions of the new section will include the launching of a new examination of price, employment, and capacity utilization relationships--as well as testing and improvement of the Board's econometric model.