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How Commodity Prices Respond to Macroeconomic News

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How commodity prices react to news about macroeconomic variables depends partly on where the economy is in the business cycle. The immediate impact of such news is often different from the one-day-lagged impact — and different for different commodity groups.

This paper — a product of the International Commodity Markets Division, International Economics Department — is part of a larger effort in PRE to develop an understanding of the formation of primary commodity prices, in particular their response to changes in macroeconomic variables. Copies are available free from the World Bank, 1818 H Street NW, Washington DC 20433. Please contact Sarah Lipscomb, room S7-062, extension 33718 (67 pages with figures and tables).

Ghura analyzed the immediate, delayed, and group responses of 20 commodity prices in four commodity groups (foods and livestock, crops, energy, and metals) to macroeconomic “news” (unexpected announcements) in the United States between 1985 and 1989. He found that:

Macroeconomic news generally affects commodities within groups in the same direction — but there is no clear evidence that the prices of largely unrelated commodity groups react in the same way to macroeconomic shocks.

News about inflation indices and the money supply did not have a major effect on commodity prices.

The business cycle must be carefully considered in analyzing the impact of macroeconomic news on commodity prices. Over the long haul, news about macroeconomic variables was unimportant — but many commodities reacted significantly to news when the economy was coming out of a local recession (October 1 to December 31, 1987). When indices of real activity were sending out “noisy” signals, most commodities did not respond significantly to news.

During the recession, unexpected movements in exchange rates appeared to affect the behavior of metal prices, both immediately and after a delay.

The prices of metals and foods and livestock commodities fell after exchange rate apprecia-

tion, while prices on most energy products and all crops appreciated. Most of the significant immediate impacts of exchange rate shocks were positive.

It was a different story with the one-day-lagged effect of exchange rate shocks. The delayed effect was positive for metals, foods and livestock, crops and oilseeds, but negative for energy products.

The significant immediate impact of interest rate shocks was positive, as expected. The one-day-lagged effect was negative, except for metals, for which it was positive.

News about real activity was important, especially during the local recession. Several commodities were sluggish in their reaction to such news, however. Most crops and energy products reacted with a one-day lag — but the response of soybeans, soybean products, and wheat was positive and the response of energy products was negative.

[Method: Ghura used survey data to measure the effect of news about macroeconomic variables that are announced periodically (money stock, inflation, and indices of real activity). He used autoregressions to measure shocks to commodity markets for variables (exchange rates and interest rates) whose values are realized on financial and credit markets.]

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Commodity Prices, Macroeconomic News, and Business Cycles

by
Dhaneshwar Ghura

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I. INTRODUCTION

1. There has been great interest over the past 15 years in the theoretical and empirical linkages between macroeconomic variables (including exchange rates) and commodity markets [Bond (1984); Batten and Belongia (1986); Belongia and King (1983); Chambers (1981, 1984, 1985); Chambers and Just (1979, 1981, 1982); Gardner (1981); Grennes and Lapp (1986); Orden (1986); Rauser et. al. (1986); and Schuh (1974)]. There is now an emerging literature on the impact of macroeconomic shocks on short-run commodity price behavior. [Barnhart (1988, 1989); Frankel (1984, 1986); Frankel and Hardouvelis (1985); Gilbert (1985, 1987)]

2. The studies by Bond, Frankel (1986), Frankel and Hardouvelis (henceforth, FH), and Gilbert (1985) emphasized the important role of expectations about macroeconomic variables in short-run commodity price dynamics. Primary storable commodities are viewed as financial assets since they are traded continuously on futures exchanges. Hence, the short-run prices of these commodities are expected to be influenced not only by market demand and supply conditions (market fundamentals), but also by "news" 1/ of macroeconomic variables 2/ (such as money stock; interest, inflation and exchange rates; and real activity indices), which affect the terms on which traders are prepared to hold title to commodity futures contracts.

1/ News refers to unpredictable new information.

2/ Of course, commodity prices and especially prices of agricultural goods are influenced not only by news of macroeconomic variables, but also by news about the weather and a host of other non-economic factors.

3. FH investigated the theoretical and empirical behavior of commodity prices prior to and following money supply announcements by the Federal Reserve System of the United States (henceforth, Fed). Barnhart extended the empirical approach taken by FH to cover the prices of more commodities and more U.S. macroeconomic announcements. These studies have shown that commodity prices have responded significantly to news over the period 1977 to 1984 and that these responses have been particularly sensitive to the monetary policy regimes adopted by the Fed.

4. However, the studies by FH and Barnhart disregarded the price movements on days when no announcements were made. Presumably, daily commodity prices are affected by other measurable economic shocks. Also, a major limitation of these studies is that despite the importance of the interlinkages between international financial and primary commodity markets (Chambers and Just; Gilbert; Schuh), they ignored any possible commodity market reactions to daily shocks from foreign exchange markets. ^{1/} Gilbert (1985) provided the theoretical interlinkages between exchange rate shocks and commodity price movements. His empirical investigation (Gilbert, 1987) analyzed quarterly movements of metal prices as explained by shocks in quarterly exchange rates. Although his analysis was an important contribution to understanding the impact of exchange rate shocks on commodity prices, it masked the important impact of daily exchange rate shocks and periodic U.S. macroeconomic announcements on daily commodity price movements. Finally,

^{1/} Barnhart (1989) recognizes the importance of exchange rate shocks in commodity price dynamics. However, he chooses to ignore it in his analysis.

another limitation of the previous studies is that they assume the responses of commodity prices to news are the same over different stages of the business cycle.

5. This paper contributes to the existing literature on the impact of macroeconomic shocks on commodity prices in a number of ways. First, the responses of commodity prices to economic news are allowed to vary over different stages of the business cycle. Second, it analyzes the simultaneous impacts of news from U.S. macroeconomic announcements and surprises from daily exchange and interest rate shocks on daily commodity price movements. For economic variables which are announced periodically (money stock, inflation and real activity indices), survey data are used to divide macroeconomic announcements into expected and unexpected components, with the latter measuring news. For other independent variables whose values are realized on financial and credit markets (exchange rates and interest rates), autoregressions are used to model their daily behavior and the residuals from these autoregressions are taken to be exogenous shocks to commodity markets. Third, recent data (01/02/85-05/31/89) are used. All existing studies analyzing the impact of economic shocks on short-run commodity price behavior have used data that date from the late seventies to the early eighties. Fourth, the price behavior of important commodities (e.g. energy products) not considered by the existing studies are analyzed.

6. The important role of exchange rate fluctuations in short-run commodity price dynamics cannot be ignored. The association of movements in daily commodity futures prices with movements in the U.S. dollar is

commonplace in the media. The international economy has experienced several major developments in the value of the dollar over the past 15 years. The dollar fell to a historically low level in the late 1970's, but rose sharply over the period 1982-84. The U.S. farm economy was deeply affected by the persistent overvaluation of the dollar as consumers and producers in other countries found prices of U.S. agricultural commodities more expensive expressed in terms of foreign currencies. By the beginning of 1985, the dollar was generally considered highly overvalued. Since then there has been a substantial depreciation. 1/

7. The rest of this paper is organized as follows. Section II gives a brief survey of the published work on the reaction of commodity prices to economic announcements and other news. Then, in Section III the theoretical framework and theoretical considerations are discussed. The data are described in Section IV. The empirical model and results are given in Section V. Finally, Section VI provides concluding remarks.

1/ See figure 3.

II. SURVEY OF LITERATURE

8. Although many studies 1/ have investigated the reactions of various rates, yields, and asset prices to macroeconomic announcements over the past 15 years, it is only recently that the reaction of commodity prices to economic news has been investigated. In an invited address to the American Agricultural Economics Association annual meetings in August 1984, Frankel (1984) noted the importance of economic news in affecting the prices of storable commodities. He argued that "An implication of the hypothesis that markets are efficient is that spot and futures prices will react when information on relevant economic variables is released to the public, but only to the extent that the variable deviates from what had previously been expected."

9. The first reported theoretical and empirical work on the reaction of commodity prices to unanticipated money growth was conducted by FH. In their theoretical development, they derived an equation relating price changes in storable commodities to weekly unanticipated monetary shocks. They showed that to get a negative relationship between price movements and unexpected money stock changes, it is not sufficient for the change in money supply to be transitory. It is also necessary that investors perceive changes in money demand (caused, for instance, by changes in real income) to be partly permanent. They emphasized that only the unanticipated component of the money

1/ See Pearce (1988) for a survey of the theoretical and empirical work on the impact of news on exchange rates. See Hardouvelis (1988) for evidence on the reaction of interest rates to economic news.

stock announcements should matter. If markets are efficient, the anticipated part of the announcement will already have been reflected in futures prices.

10. In their empirical analysis, FH considered the reaction of Friday "closed" to Monday "open" price quotations of nine commodities to Friday money announcements. 1/ They divided their sample into two sub-periods 2/ to analyze the impact of monetary shocks on commodity prices under two different monetary policy regimes of the Fed. In the first sub-period, they found that except for a significant positive reaction of cocoa prices to positive money shocks, commodity prices did not react significantly. They interpreted this result to mean that markets did not have faith in the Fed's commitments to achieve its pronounced yearly money growth targets, i.e., positive money surprises were interpreted as indicating more of the same in the future.

11. In the second sub-period, they found that four of the commodity prices reacted negatively to positive money surprises. The nine commodities

1/ The period analyzed was 11/03/78-11/05/82. In that period the Fed was announcing money supply on Friday afternoons. The commodities considered were gold, silver, sugar, cocoa, cattle, feeders, wheat, corn and soybeans.

2/ These two sub-periods correspond to two different monetary regimes of the Fed. In the first sub-period (11/03/78-10/05/79), the Fed targeted the federal funds rate. Prior to October 6, 1979, the Fed accommodated shifts in money demand so that interest rate fluctuations were smoothed and money supply was not closely controlled. In the second sub-period (10/06/79-11/05/82), emphasis was put on monetary aggregates (e.g. non-borrowed reserves). In that period, the growth rate of narrowly defined money (M1) was controlled closely and wider fluctuations for interest rates were tolerated.

as a group had a significant negative reaction to positive money shocks. They attributed this finding to the fact that markets had confidence in the Fed's commitments to stick to a monetary growth rate for M1. That is, speculators believed that high money growth rates in period t would be offset by monetary contraction in period $t+1$, causing inflationary expectations to go down, real rates to go up, bonds to become more attractive and commodity futures contracts to be less attractive. They also found some delayed reaction of prices to monetary shocks and attributed it to market inefficiency.

12. In a theoretical piece, Frankel (1986), focused on the impact of monetary disturbances on prices of storable commodities. His model was a direct application of the Dornbusch overshooting model in which commodity prices were substituted for prices of foreign currencies. Frankel argued that monetary policy has an impact on real agricultural commodity prices even though the latter are flexible, because the prices of other goods are sticky. For instance, since an unexpected increase in the nominal money supply is an increase in the real money supply in the short-run, there is a decrease in the real interest rate which in turn causes real commodity prices to appreciate. However, since commodities are storable, they are subject to the arbitrage condition that the expected rate of change in their prices minus storage costs must be equal to the short-term interest rates. Given this condition, commodity prices must rise today and by more than the proportion by which they are expected to rise in the long-run. That is, commodity prices overshoot their new long-run equilibrium in order to generate expectations of future depreciations sufficient to offset the lower interest rate.

13. Barnhart (1988, 1989) made important empirical contributions to this literature by extending the empirical approach taken by FH to account for more commodities 1/ and announcements. In his 1988 article, Barnhart analyzed the reaction of commodity prices to macroeconomic announcements 2/ under different monetary regimes of the Fed in an attempt to distinguish between two competing theories of price movements -- namely the "policy anticipation hypothesis" and the "inflationary expectations hypothesis." 3/ He divided his sample into three sub-periods 4/ to do so. The results conform with those of FH. That is, no significant reaction of commodity prices to unanticipated money was observed in the first sub-period. Also, in general, most of the news elements considered did not matter much in explaining commodity price movements. In the second sub-period, most of the significant negative reactions were from unanticipated monetary variables including money, and discount and surcharge rates. Therefore, Barnhart's results conform with the predictions of the policy anticipation hypothesis.

1/ The commodities were barley, cattle, cocoa, coffee, copper, corn, gold, hogs, lumber, oats, silver, soybeans, soymeal, soyoil and wheat. The dependent variables were calculated as the difference between the close or open prices prior to the announcements or to the open or close prices following the announcements.

2/ These were announcements on discount rates, surcharge rates, money stocks, inflation rates, unemployment rates and industrial production.

3/ See Section III under "Impact of Money Surprises" for an explanation.

4/ The period of analysis is 10/06/77-12/28/84. The three sub-periods correspond to three different monetary regimes of the Fed. The first two sub-periods correspond to those of FH and are subject to the monetary policies described in footnote 2, page 7. In the third sub-period (10/06/82-12/28/84), the Fed returned to its pre-October 1979 target.

14. However, in the third sub-sample period, Barnhart found significant negative reactions of commodity prices to unanticipated money but no reaction to unanticipated discount rate changes. This result is puzzling given the fact that the Fed did not have any specific target for M1 in that period and was targeting the federal funds rate. Barnhart also found significant positive reactions of commodity prices to unanticipated surges in economic activity in the third sub-period.

15. In analyzing the whole sample, Barnhart found that six of the commodities reacted significantly to both discount and surcharge rate surprises, while ten commodities reacted significantly to money supply announcements. These reactions were all predominantly negative. Furthermore, he found a significant delayed reaction to several of the news components and like FH attributed it to market inefficiency.

16. Barnhart's 1989 article was an extension of his 1988 article; in the latter paper he considers the same commodities with a few more announcements over the period 2/15/80-12/28/84. Several of the news elements considered (e.g., consumer installment credit, manufacturers' orders for durable goods, housing starts, retail sales and the trade deficit) are not predicted by the theory 1/. However, it is possible that surprises in these variables might indirectly affect the terms on which speculators hold contracts to commodities

1/ Only news from the credit market (interest rates), the foreign exchange market, real activity, inflation, and money stock are predicted by the theory. See Gilbert (1985, 1987) for a discussion of the first four news components and how they affect commodity prices. Frankel and Hardouvelis (1985) discuss the theoretical links between unanticipated money and commodity prices.

and hence affect their prices. Barnhart found that the news contained in the variables not predicted by theory are not generally important in affecting prices. As in his earlier study Barnhart found that surprises in the monetary variables (M1, discount and surcharge rates) cause the majority of the significant commodity price responses following announcements.

17. Gilbert (1985) derived the theoretical links between commodity price changes and innovations in interest rates, exchange rates and inflation, and between innovations in expected supply and demand for the commodity over the period during which stocks are to be held. The main contribution of Gilbert's work is on the theoretical linkage between exchange rate shocks and commodity prices. His model predicts that an unexpected appreciation in the dollar results in a less-than-proportional fall in the dollar price of commodities (as a weighted average of the exchange rate changes, where the weights depend on production and consumption shares and supply and demand elasticities). The predictions of the other variables of his model are discussed in the next Section.

18. In his 1987 article, Gilbert used quarterly data on metal 1/ prices to verify the predictions of his 1985 theoretical article. He measured news

1/ These were prices of aluminum, copper, lead, nickel, silver, tin, and zinc from the London Metal Exchange. The sample covered the period 1978q1 to 1985q4.

in exchange rates, 1/ interest rates, inflation and real activity by taking the residuals from autoregressions on quarterly data. Prices were found to respond to exchange rate surprises as predicted by the theory. That is, prices tend to appreciate with unexpected depreciations of the dollar, and vice versa. However, it was found that the interest, inflation and real activity innovation effects were relatively poorly defined. This may have been due to the fact that the measurement of news was too crude and that use of quarterly data effectively masked any news element. It was also concluded that there was evidence of weak-form inefficiency in the London Metal Exchange. This result concurs with findings by Barnhart (1988) and FH.

1/ Exchange rates were measured as a GNP-weighted index of OECD countries exchange rates with respect to the U.S. dollar. Interest rates were the U.S. Treasury bill rate. Industrial production (to account for real activity) and inflation rates were weighted indexes of OECD countries.

III. THEORETICAL CONSIDERATIONS

19. In this section, a simple model is developed to explain the impact of new information on commodity prices. Following the specification, the theoretical links between daily commodity price movements and new information about daily movements in exchange and interest rates, weekly announcements of the money stock, and monthly announcements of inflation and real activity indices are discussed.

20. The main motivations for a trader to hold commodity futures contracts in a portfolio with other liquid assets (such as stocks, bonds, foreign currencies, and money) are for diversification, risk minimization and short-run profit maximization. Any unexpected new information which affects the trader's perceptions of the future time path of his net profit flow on that portfolio will make him revise the proportion of each asset held. Such reshuffling will cause commodity prices to change accordingly, either temporarily or permanently. Hence, news results in the revision of the dynamic paths of commodity prices.

The Model

21. The efficient markets hypothesis attributes daily movements of financial asset prices to news about fundamental economic variables. Hence, the analysis is set in an efficient market framework where

$$DP_i(t) = a + DUZ(t)B + u(t) \quad (1)$$

and

$DP_i(t)$ = percentage change in the i-th commodity futures price from the close of trading on day t-1 to the close of trading on day t;

$DUZ(t)$ = unexpected percentage change in economic data contained in vector $Z(t)$, computed as the difference between announced or realized values and expected values, $= (\ln[AZ(t)] - \ln[EZ(t)]) * 100$;

$DEZ(t)$ = expected percentage change of variables in vector $Z(t) = (\ln[EZ(t)] - \ln[AZ(t-1)]) * 100$;

$AZ(t)$ = announced or realized values of variables in vector $Z(t)$;

$EZ(t)$ = expected values of variables in vector $Z(t)$;

$Z(t)$ = vector containing the following variables: money supply; interest, unemployment and exchange rates; industrial production and inflation indices;

$u(t)$ = random disturbance 1/ term with zero mean and constant variance;

and

B is a vector of parameters and a is a scalar parameter intended for estimation.

If expectations are rational,

$$UZ(t) = AZ(t) - E[Z(t)/I(t-1)], \quad (2)$$

where $UZ(t)$ is the unexpected values of variables in vector $Z(t)$, $AZ(t)$ is as defined before, E is the expectation operator and $I(t-1)$ is the information set available at time $(t-1)$. If markets are efficient, only the unexpected part of any economic announcement or realized values of economic variables

1/ It is assumed that $u(t)$ is uncorrelated with information known as of the close of trading on day t-1.

should cause prices to change. Events which are expected, presumably are built into the forecast process by rational economic agents. Economic news alters agents' expectations about the future course of economic variables which in turn changes prices of commodities.

Impact of Money Surprises

22. The first category of economic news considered here is contained in weekly announcements of U.S. money supply. Although it is widely accepted that monetary policy is neutral with respect to commodity prices over the long-run 1/, it is not so obvious that monetary shocks are neutral over the short-run. 2/

23. According to the policy anticipation hypothesis about how weekly money stock announcements influence commodity prices, speculators in the commodity markets believe that the unexpected money growth in period t will be offset in period $t+1$ as the Fed restricts the money supply, driving up real interest rates. A rise in real rates will lead to a fall in commodity prices as investors make a portfolio adjustment to hold more money and fewer physical assets. By contrast, the expected inflation hypothesis assumes that the Fed will not offset increases in the money stock but will keep on increasing the

1/ See Grennes and Lapp (1986), for instance.

2/ Results from Frankel and Hardouvelis (1985) and Barnhart (1988, 1989) point to the importance of monetary shocks for short-run commodity price behavior. However, the impact of monetary shocks is very sensitive to the operating procedure of the Fed.

money supply, resulting in higher inflation expectations. In this case, commodity futures contracts become attractive as investors move out of money and decide to hold more physical assets such as stocks, foreign currencies, and commodity futures.

24. As described earlier, since the late seventies, at least four different operating procedures appear to have been used by the Fed. If these descriptions of the changes in the Fed's monetary policies are correct, commodity prices should not have reacted to unanticipated money in the pre-October 1979 and post-October 1982 periods and depreciated after a positive money shock in the October 1979 to October 1982 period. Both FH and Barnhart (1988) have found this to be the case for the period 1977-1982. Also, Barnhart found that several commodities reacted negatively to positive shocks in M1 in the post-October 1982 period when the Fed was operating under a borrowed reserve policy regime.

25. In the mid-eighties, the Fed has apparently stopped targeting growth rates for its monetary aggregates, although it seems that it has been more interested in setting target rates for M2 and M3 rather than for M1. The Federal Reserve Bulletin (December 1985) states that "... adjustment should not be made automatically in response to the behavior of monetary aggregates alone, but should take broader economic and financial developments into account, including conditions in domestic and international financial markets." The factors that are now apparently taken into consideration in the conduct of U.S. monetary policy are: behavior of monetary aggregates; strength of the business expansion; performance of the dollar in the foreign

exchange markets; progress against inflation; and conditions in domestic and international markets. Given this, unexpected movements in M1 alone are no longer a good guide to future monetary policy and should not have caused commodity prices to react significantly in the period 01/02/85-05/31/89.

Impact of Inflation Surprises

26. The second category of news considered is from monthly announcements of the Producer Price Index (PPI) and the Consumer Price Index (CPI). The linkage between unexpected inflation and daily commodity price movements depends on how investors interpret the news in regard to inflationary expectations and in regard to how they expect the Fed to react to the inflation figures. If the announcements activate a fear of renewed inflation, investors move out of money and into physical assets. Thus, they demand more commodity futures contracts, causing commodity prices to rise. If, however, speculators believe that the Fed will resort to a restrictive monetary policy due to the unexpected increase in inflation, causing nominal interest rates to rise in excess of expected inflation, real interest rates should rise. In this case, investors will adjust their portfolio by selling commodity contracts, stocks, and foreign currencies and by holding more money. Hence, commodity prices would be expected to fall.

Impact of Real Activity Surprises

27. The third category of news considered is from the announcements about real economic variables -- industrial production and unemployment rates.

Unexpected economic growth as manifested by an unexpected increase in industrial output and/or a decline in unemployment could be expected to have ambiguous effects on commodity price growth rates since this "good" news can be viewed by investors in two ways--depending in part on the stage of the economic cycle. First, news of a strengthening of economic activity may increase investors' confidence about future growth in the economy. In such a case, investors will increase their demand for short-run investments causing short-term nominal and hence real interest rates to rise (assuming inflation expectations do not change). Again, commodity prices would be expected to fall for reasons discussed earlier. On the other hand, investors might interpret the strengthening of economic activity as a sign of an "overheating" economy. There are two possible price reactions in this case. If traders expect the Fed to react by contracting money supply, real rates should go up and hence commodity prices fall. However, if traders believe that the Fed will remain passive and hence increase their inflationary expectations, real interest rates are supposed to fall causing commodity prices to rise as investors demand more commodity contracts. Therefore, the overall impact of news of real activity is ambiguous and can only be determined empirically. Moreover, the stage of the cycle may affect the reaction to news about other macroeconomic variables.

Impact of Interest Rate Surprises

28. The impact of a surprise in nominal interest rates is also ambiguous with respect to commodity prices since it depends on the extent to which the surprise in the nominal rate reflects a real rate surprise and the extent to

which investors perceive the Fed to smooth interest rate swings. If a positive nominal rate shock is in excess of inflationary expectations, it translates into a positive real rate shock and commodity prices would be expected to fall for two important reasons. First, investors adjust their portfolio by holding more money and fewer commodity contracts. Also, for storable commodities, real interest rate surprises 1/ are important since interest rates are a major cost component in storage. An unexpected rise in real rates makes it more costly to hold inventories. In the short-run, traders will get rid of their inventories and cut further demand for them. This action will, in turn, cause commodity prices to fall. Chambers (1984, 1985) provides theoretical evidence for this reasoning. However, if positive nominal interest rate shocks are not in excess of increases in expected inflation, real rates fall and commodity prices rise. Also, if investors have any reason to believe that the Fed might smooth out interest rate swings by counteracting wide unanticipated interest rate movements, commodity prices might react in one direction in day t and in an opposite direction in day $t + 1$ to shocks occurring in day t . This kind of behavior is observed.

1/ Barnhart provides empirical evidence on the important impact on commodity prices of unexpected changes in announced discount rates. The present study considers the impact of daily interest rate surprises on commodity markets. In this way one can capture the full effect of surprises from the credit markets on the commodity markets. Also, a higher discount rate will most likely translate into a higher market rate and hence the impact of unexpected changes in discount rates are also captured in this way.

Impact of Exchange Rate Surprises

29. The last category of news considered is unexpected exchange rate movements. With the exception of Gilbert (1985, 1987), no other study has investigated the impact of economic news from the international economy as embodied, say, in unexpected movements of exchange rates on commodity prices. Exchange rate fluctuations appear to be a major source of variability in commodity prices. Gilbert (1985), in the context of (i) independence of price expectations of the country in which these expectations are formed, (ii) efficient forward exchange markets, (iii) covered interest parity, and (iv) no transportation costs, developed the theoretical linkage between commodity price movements and news from the foreign exchange markets. The implication of his derivation is that an unexpected one percent appreciation of the dollar results in a less than proportional fall in the dollar price of commodities.

1/ Schuh has noted that U.S. agricultural goods lose their international competitiveness when the dollar appreciates. When the dollar gains in strength, U.S. goods become more expensive in terms of foreign currencies and foreign demand falls causing commodity prices to fall in the U.S. Chambers and Just (1981) have shown empirically that when the dollar is strong, U.S. prices of soybeans, wheat and corn fall significantly. Also, Orden, using a Vector-Autoregressive (VAR) model, has shown that a decline in the real value of the dollar has a positive effect on relative agricultural prices.

1/ The factor of proportionality in his study reflects the shares in supply and demand of the various producing and consuming countries and the magnitude of their demand and supply elasticities.

IV. DATA AND VARIABLE SPECIFICATION

30. The data for commodity prices, economic announcements, and expected values of economic announcements are discussed in this section. The sample period begins on January 2, 1985, and ends on May 31, 1989. Because of the important role of expectations, the expectations data are discussed in detail.

Commodity Prices

31. Table 1 gives a summary of the important characteristics of the commodities considered. Figures 4 to 23 show the monthly movements of the commodity prices used in this study. To investigate the responses of commodity prices to new information, daily percentage changes in closing price quotations on "nearby" futures contracts were used. A nearby is a continuous price series for a contract. Since a futures contract stops trading on its expiration date, nearbys were created by "splicing" individual successive futures contracts together. For example, if a commodity (e.g. cotton) had contracts that matured in the months numbered 3 (March), 5 (May), 7 (July), 10 (October), 12 (December), the futures prices of the contract maturing in month 3 were used until calendar month 3, then prices of contracts maturing in month 5 were used until calendar month 5, etc. 1/

1/ All commodity futures price data are from Data Resources, The McGraw-Hill Financial and Economic Information Company, Lexington, Massachusetts.

Announcement Data

32. The money stock data consist of announced weekly percentage changes in narrowly defined money stock (MS) as reported in the Federal Reserve H.6 Statistical Release. 1/ Since March 22, 1984, the money stock announcements have been made on Thursdays at 4:30 P.M. (E.S.T.). The Fed announces changes in the level of the money stock for the statement week ending on Wednesday of the previous calendar week minus the revised estimate of the previously reported level of the money stock.

33. The data on inflation are the monthly percentage changes in the producer price index (PPI) and the consumer price index (CPI), as announced by the Bureau of Labor Statistics (BLS). These two figures on inflation are released at 8:30 a.m. once every month on various days of the week and the released figures provide inflation information during the preceeding month. The PPI announcement is always made earlier in the month than the CPI announcement and hence it may contain more news on inflation for the preceeding month. The announced figures for the CPI and PPI are from the BLS Press Release.

34. Data on industrial production (IP) and unemployment rate (UR) are used to represent information on real economic activity. Both indicators are announced monthly on various days of the week and they report figures for the previous month. The figures for the percentage change in industrial

1/ The narrowly defined money stock was used in this study because a survey of expectations data on M2 and M3 by MMS International are available starting February 1988.

production are announced by the Fed at 9:15 a.m. They are reported in the Federal Reserve G.12.3 Statistical Release. The unemployment rate figures are announced by the BLS at 8:30 a.m. They are reported in the BLS Press Release.

35. Great care was taken to match the dates of the announcements with the price changes. Since money announcements are made on Thursday afternoons after the commodity markets are closed, the unanticipated component of money announcements were matched with the difference between the Friday close and the Thursday close prices to measure the immediate impact of shocks in the money supply on commodity prices. Also, since all the other announcements are made while the markets are open, the unanticipated components of these announcements were matched with the differences between the close of the announcement day and the close of the previous day to measure the immediate impact.

Expectations and Market Data, and Economic News

36. For those variables (MS, PPI, CPI, IP, UR) for which regular announcements are made, market expectations data were used. These expectations are from surveys conducted by MMS International, Redwood City, California, USA. They consist of median responses from surveys of approximately 40 to 60 market participants. These market expectations are good proxies for market expectations since they have been shown to be unbiased and efficient (Pearce and Roley, 1985).

37. The unanticipated component of the money supply is defined in percentage terms as $UMS(t) = ([MS(t) - MS(t-1) + EMS(t)] / M(t-1)) * 100$, where

MS(t) is defined above, EMS(t) is the survey median of the expected change in money stock from the previous announcement in week t-1 to the present, and M is the money stock level. The anticipated component of the money supply is calculated as: $AM(t) = [EMS(t)/M(t-1)]*100$.

38. The announced percentage change in the UR (AUR) is calculated as $([AUR(t) - AUR(t-1)]/AUR(t-1))*100$, where AUR(t) is the announced level of unemployment in period t; and the expected percentage change in the unemployment rate (EUR) is calculated as follows: $([EUR(t) - AUR(t-1)]/AUR(t-1))*100$, where EUR(t) is the market median survey of the unemployment rate level for period t.

39. For other announced variables used in this study (PPI, CPI, IP), since both the announced and expected figures are themselves in terms of percentage changes, the unexpected percentage changes are calculated as the differences between the announced and survey expectations figures.

40. The two remaining independent variables are: the unexpected changes in daily interest rates (IR) and exchange rates (ER). The interest rate chosen is the three-month U.S. Treasury bill rate. It is the daily average as reported by the U.S. Treasury. The exchange rate is defined as the London noon quotation of the number of SDR per U.S. dollar as reported by the Bank of England. ^{1/} An increase in that number corresponds to an appreciation of the dollar. Both of these rates were obtained from International Monetary Fund

^{1/} This exchange rate is chosen for two important reasons. First, in terms of timing, investors in the U.S. have access to it in the morning. Second, the SDR/U.S. dollar rate summarizes the movements of a basket of important international currencies vis-a-vis the U.S. dollar.

(IMF) data tapes. The daily values of these two rates are realized in the financial markets and are not announced. They themselves respond to economic announcements as shown by Hardouvelis (1988). However, in this study, it is assumed that unexpected changes in the daily interest rate and exchange rate are exogenous 1/ to the behavior of commodity prices. This is a reasonable assumption given the fact that these rates adjust very quickly to economic announcements. Hakkio and Pearce (1985) have shown that exchange rates adjust to economic announcements within 20 minutes, while Barnhart and FH have shown that commodity prices are somewhat sluggish in their reaction to economic news. Exchange rate and interest rate surprises have been calculated as the residuals from second order autoregressions of the daily series of these rates. 2/

Business Cycle Data

41. The business cycle is measured as the spread between the actual natural log of industrial production and the trend natural log of industrial production. The trend was found by regressing the actual natural log of industrial production on a constant and a time index. Results of these regressions are shown in Figures 1 and 2 for the periods starting in January

1/ Empirical analysis of the impact of unexpected announcements of money stock, consumer, producer and industrial production indices, and unemployment rates on the residuals from autoregressions of daily exchange and interest rates did not indicate any statistically significant influence. Hence, this assumption is justified.

2/ This method for calculating surprises implicitly assumes that agents know in period t the underlying coefficients of their forecasting model in periods $t+1$, $t+2$, However, this procedure is justified if the coefficients of the forecasting models have not changed significantly over time. This was the case.

1980 and January 1985, respectively. The data on industrial production were obtained from the IMF data tapes and were seasonably adjusted.

V. EMPIRICAL FRAMEWORK AND RESULTS

The Empirical Model

42. The empirical equation estimated is

$$DP_i(t) = a + DUZ(t)B + LDUZ(t)C + u(t) \quad (3)$$

where $LDUZ(t)$ is the one-day-lagged values of the unexpected percentage changes in economic data contained in vector $Z(t)$, C (like B) is a vector of parameters intended for estimation, and all other variables are defined as in equation (1).

General Observations

43. The results of estimation 1/ of equation (3) are given in Tables 2-5 for the whole period (Table 2) and for sub-periods 2/ (Tables 3-5). An important result to note is that an analysis of the impact of macroeconomic news over the whole period (01/02/85-05/31/89) reveals that most commodity prices did not react significantly to news. However, the same analysis conducted over sub-periods suggests that most commodity prices reacted

1/ There is empirical evidence (see Milanos, 1986, for instance) that the first differences of commodity prices have a tendency to exhibit heteroskedasticity. The results given here are those obtained after correction for an unknown form of heteroskedasticity.

2/ The analysis is conducted by considering each sub-period separately and not by analyzing the whole sample and using dummy variables to distinguish different phases of the business cycle, because it is assumed that the variances of the econometric models for the different sub-periods are different.

significantly to macroeconomic news in the period 10/01/86-12/31/87 (period two). In the sub-periods 01/02/85-09/30/86 (period one) and 01/02/88-05/31/89 (period three) there was no significant reaction to macroeconomic news for virtually all commodities.

44. Period two spans over 15 months and exhibits two important and distinguishing features. First, the economy was rapidly moving out of a local recession which had started around January of 1986. 1/ Second, there was virtually no mixed signals from the real activity index of industrial production. However, in the other two sub-periods the index of industrial production was sending out noisy signals to investors, sometimes going up and sometimes going down.

45. Each of the coefficients shown in the Tables (2-5) represents the percentage change in commodity prices following a one percentage unexpected change in the relevant variable. For instance, from Table 4, a one percent appreciation of the dollar causes the price of cocoa to fall by six-tenths of a percentage point. For a contract representing 10 metric tons trading at one dollar per metric ton, this corresponds to an approximate decline of six-tenths of one cent which translates into a depreciation of about 6 cents for the value of the contract. The impact of the other variables on commodity prices can be derived in a similar way by using the information given in Table 1.

1/ The phrase "local recession" is used in the mathematical sense here to mean a recession during the period covered in this study. There was a more pronounced recession in the early part of the eighties.

46. Three F-statistics are given in Tables 2-5. The F-statistic F1 tests the null hypothesis that the impact of all the included variables in equation (3)--variables measuring both the immediate and the lagged responses--is jointly equal to zero. F2 tests the null hypothesis that the joint impact of variables (UMS, UPPI, UCPI, UIP, UUR, UIR and UER)--measuring the immediate response--is equal to zero. F3 tests the same the hypothesis as F2 but for the variables (LUMS, LUPPI, LUCPI, LUIP, LUUR, LUIR and LUER) which measure the one-day-lagged impact.

47. Each variable generally affects each commodity within a group in a uniform direction. However, there is no solid evidence that economic news affects largely unrelated commodity groups in a uniform direction. Also, several of the commodities reacted to news with delay, indicating the possibility of market inefficiency in commodity markets. This result concurs with those of Barnhart (1988), FH, and Gilbert (1987).

Impact of Exchange Rate Surprises

48. It is clear from the results that news from the foreign exchange markets is important for the behavior of daily commodity prices. The majority of the significant immediate impacts of unexpected exchange rate appreciations on commodity prices are negative and are of particular importance in explaining the price movements of precious metals, cocoa, and live cattle. The results on the direction of the immediate impact of exchange rate shocks concur both with theory and with the empirical findings of Gilbert (1987) for quarterly London Metal Exchange metal prices. Most of the significant one-day-lagged impacts of exchange rate news are positive, however. This result

is especially true for period two where all the significant impacts of positive exchange rate shocks are positive. This result is puzzling and may be explained by the expectation that there might be intervention by the Fed to counteract large unexpected swings in exchange rates.

49. It is also surprising that other commodity prices such as soybeans and corn do not respond significantly to exchange rate movements. This may be due to the exchange rate used (SDR/US\$) which does not adequately represent the exchange rate movements of countries which compete most closely with the United States as consumers or producers of these commodities.

Impact of Interest Rate Surprises

50. News from the credit markets, as reflected by unexpected movements in the three-month treasury bill rate, is also important for explaining the behavior of daily commodity price movements and is of particular importance in period two. News from the credit markets is of particular importance in explaining the price movements of crops, soybeans and soybean products, and some metals. The immediate significant impacts for most commodity prices are positive. An implication of this finding is that nominal interest rate variation appears to be related to variations in inflationary expectations, a finding supporting the view advanced by Fama and Gibbons (1982). 1/

1/ Over the period when the Fed was targeting M1, however, nominal interest rate variations was related more to real rate variations and commodity prices should have reacted negatively to positive shocks in the discount rate. See Barnhart (1988) for a confirmation of this result.

51. The strong positive immediate reaction of copper prices to positive interest rate shocks is easy to explain. A large percentage of the demand for copper is for industrial use. However, most of the significant one-day-lagged impacts of positive interest rate shocks were negative. Commodities such as cocoa, corn, soybeans, soymeal, and soyoil which had positive immediate reactions to unexpected increases in interest rates react negatively with a one-day-lag to the same shock. Such reversal in the one-day-lagged results for interest rates may reflect the expectation of a subsequent reversal as investors have reasons to believe that the Fed might counteract large unexpected swings in interest rates.

Impact of Real Activity Surprises

52. The news from real activity announcements was generally more important than news from any other announcements. The importance of news about real activity was of particular importance in period two. In that period, 11 commodities reacted to news from the industrial production figures or from the unemployment rate figures either immediately or with lag. Most of the adjustment to news about real activity came with a lagged effect, possibly indicating some uncertainty on the part of investors about the future course of real activity. One result to note about period two is that different commodity groups reacted to news about real activity differently. However, the majority of the significant effects of news of a surge in real activity was to raise prices. The strongest lagged impact from news about industrial production was in the soybean complex and wheat prices. The implication of this positive price response is that investors had a tendency to believe that the Fed would remain passive, hence causing inflation expectations to go up.

That the Fed would remain passive in such a period, i.e., when the economy is coming out of a local recession is not implausible. The major exception to this reaction is the immediate impact on silver prices of industrial production and unemployment rate shocks. The decline in silver prices in response to a surge in the economy indicates that investors in the metals market took the news to imply that real interest rates would rise and inflation expectations would stay constant.

Impact of Money and Inflation Surprises

53. Surprises from the money and inflation announcements generally did not induce any significant reactions from commodity prices. The few significant responses were not strong nor consistent within or across commodity groups. Only the price of platinum responded to monetary surprises over the whole period. In period one, only the price of cocoa and soybeans reacted significantly to money shocks; their prices rose as money supply went up unexpectedly. In period two five commodities responded significantly to money shocks, either immediately or with a lag. The direction of the responses was not uniform, however. The immediate responses of palladium, heating oil and unleaded gasoline were positive, following unexpected money increases, whereas the immediate response of wheat and the lagged responses of live cattle and wheat were negative. An interpretation of such mixed results is not easy. In period three, only five of the commodities responded significantly to news about the money supply. The immediate impact on cocoa, orange juice, and copper was significant and negative, while the impact on heating oil and palladium was positive.

54. The fact that most commodity prices were not significantly affected by money supply shocks can be due to a number of reasons. Perhaps the most logical one is that since the Fed did not have a specific target for M1 during this period, investors did not pay much attention to unexpected movements in M1. This interpretation concurs with the findings of Barnhart and FH on the behavior of commodity prices prior to October 1979 when the Fed did not emphasize target rates for M1. Dwyer and Hafer also provide evidence on the insignificant responses of three-month Treasury bills and 30-year Treasury bonds rates to money stock surprises in the period 1984-87. If this interpretation is correct, commodity prices should have reacted significantly to interest rate shocks since the Fed is more apt to take measures to offset interest rate swings. As has been seen, interest rate shocks caused many commodity prices to be significantly affected. It is also possible, as shown by FH and Barnhart, that most commodity markets react to shocks in M1 very rapidly and that movements in daily close-to-close prices are not capturing that effect.

55. With the exception of heating oil and gasoline prices, most of the significant immediate price reactions to news about inflation was negative, indicating that there was fear among investors of future tightening of credit by the Fed. However, the fact that the unexpected components of inflation announcements did not induce immediate and/or significant reactions from many commodities is not surprising given that inflation was not seen to be a problem in the period of analysis. Therefore, the majority of investors might not have reacted strongly to inflation news given that they did have any reason to believe the Fed to tighten credit.

Grouped Commodity Responses

56. Table 6 presents the results of the grouped seemingly unrelated regression (SUR) commodity responses where the slope coefficients in each equation are constrained to be equal. Results are given for the whole sample period and for sub-periods. The R^2 is a goodness-of-fit measure for a SUR system [see Judge et. al., pages 477-78].

57. An interesting result to note is the importance of the real activity news (both immediate and lagged) for the group of energy products. Analysis of the whole period reveals that energy prices increased significantly as the unemployment rate declined unexpectedly.

58. However, the majority of the lagged reactions to unexpected increases in industrial production in periods one and three were negative. In both of these periods, the economy was above the trend in industrial production (see Figure 2). In such periods, news about increases in industrial production might have been interpreted as bad news, inducing the belief among traders of possible credit tightening by the Fed. However, the lagged reaction of the prices of the crops and oilseeds group was positive in period two when the economy was coming out of a local recession, indicating that in that period investors had reasons to believe that the Fed would remain passive in its control of credit, thus raising inflation expectations and commodity prices.

59. Other results confirm the major findings from the individual responses. The importance of the immediate impact of exchange rate shocks on foods and livestock, crops and oilseeds, and metals is identified. All the significant immediate responses are strong and negative, as expected.

Surprisingly, only the prices of the metals group responded significantly to exchange rate surprises in periods one and two. However, the signs of the responses in the two periods are different. The importance of the immediate and lagged impact of interest rate surprises for crops and oilseeds and metals groups are also confirmed. It is interesting to note that energy prices as a group had a significant negative immediate reaction to positive interest rate surprises in period three.

VI. SUMMARY AND CONCLUSIONS

60. This paper has presented evidence on the reaction of 20 commodity futures prices to news in announcements about money supply (M1), inflation indices (CPI and PPI), and real activity indices (industrial production and unemployment) and to shocks from the foreign exchange and credit markets. For macroeconomic variables (money stock, CPI, PPI, the unemployment rate and the industrial production index) about which announcements are made periodically, survey data were used to separate the announcements into expected and unexpected components--with the latter measuring news. For other macroeconomic variables, whose values are realized on financial and credit markets (exchange rates and interest rates), autoregressions were used to model their daily behavior and the residuals from these autoregressions were taken to be exogenous shocks to commodity markets.

61. It was found that careful consideration must be given to the stage of the business cycle when analyzing the impact of news on commodity prices. The reaction to news about other macroeconomic variables as well as to economic activity variables themselves appears to be affected by the stage of the business cycle. Most of the significant commodity price reactions were in the period 10/01/86-12/31/87 when the economy was moving out of a local recession. It is not clear why this is so; several possible reasons have been presented. It is a question which warrants further investigation. News about real activity initiated a response in commodity prices virtually only when the economy was moving out of a local recession. The impact of exchange rate and interest rate shocks on commodity prices were found to be significant.

62. News from the money stock and from inflation indices was generally not important in explaining commodity price behavior. The fact that announcements about the money stock did not cause commodity prices to react significantly is not surprising given that the Fed did not have a specific target for M1 during the sample period. It is possible therefore that investors no longer use unexpected announcements of narrowly defined money as a guide to the future monetary policy of the Fed. This interpretation concurs with the findings of Barnhart and FH on the behavior of commodity prices prior to October 1979 when the Fed did not emphasize target rates for M1. Because the Fed now follows several indicators as a guide for its monetary policy plus the fact that during the sample period there was little concern over an increase in inflation seems to explain the lack of reaction to news about inflation indices.

63. Finally, several of the commodities responded to news with delay, indicating signs of inefficiency in the commodity markets.

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Table 1 - Commodity Futures Contract Characteristics

Commodity	Code	Exchange /A	Delivery Months	Trading /B Hours (E.S.T.)	Contract /C Size	Minimum /C Price Change		Maximum /C Price Change	
						Per Unit	Per Contract	Per Unit	Per Contract
Foods & Livestock									
Cocoa	CO	CSCE	3,5,7,9,12	9:30-3:00	10 metric tons	\$ 1/ton	\$10.00	\$88.00/ton	\$ 880
Coffee	CF	CSCE	3,5,7,9,12	9:45-2:28	37,500 lb	\$.0001/lb	\$ 3.75	\$.04/lb	\$1,500
Live Cattles	LC	CME	2,4,6,8,10,12	10:05-2:00	40,000 lb	\$.00025/lb	\$10.00	\$.015/lb	\$ 600
Orange Juice	OJ	NYCE	1,3,5,7,9,11	10:15-2:45	15,000 lb	\$.0005/lb	\$ 7.50	\$.05/lb	\$ 750
Pork Bellies	PB	CME	2,3,3,7,8	10:10-2:00	38,000 lb	\$.00025/lb	\$ 9.50	\$.02/lb	\$ 760
Sugar (#11) (World)	SU	CSCE	1,3,5,7,9,10	10:00-1:43	112,000 lb	\$.0001/lb	\$11.20	\$.005/lb	\$ 560
Crops									
Corn	CN	CBT	3,5,7,9,12	10:30-2:15	5,000 bus.	\$.0025/bus.	\$12.50	\$.10 bus.	\$ 500
Cotton (#2)	CT	NYCE	3,5,7,10,12	10:30-3:00	50,000 lb	\$.0001/lb	\$ 5.00	\$.02/lb	\$1,000
Soybeans	SB	CBT	1,3,5,7,8,9,11	10:30-2:15	5,000 bus.	\$.0025/bus.	\$12.50	\$.30/bus.	\$1,500
Soy Meal	SM	CB	1,3,5,7,8,9,10,12	10:30-2:15	100 tons	\$.10/ton	\$10.00	\$10.00/ton	\$1,000
Soy Oil	BO	CBT	1,3,5,7,8,9,12	10:30-2:15	60,000 lb	\$.0001/lb	\$ 6.00	\$.01/lb	\$ 600
Wheat	WH	CBT	3,5,7,9,12	10:30-2:15	5,000 bus.	\$.0025/bus.	\$12.50	\$.20/bus.	\$1,000
Energies									
Crude Oil	OX	NYMEX	All Months	9:30-3:30	1,000 barrels	\$.01/barrel	\$10.00	\$1.00/barrel	\$1,000
Heating Oil (#2)	OH	NYMEX	All Months	9:50-3:05	1,000 barrels	\$.0001/gallon	\$ 4.20*	\$.02/gallon	\$ 840
Gasoline (regular unleaded)	HU	NYMEX	All Months	9:55-3:00	1,000 barrels	\$.0001/gallon	\$ 4.20	\$.02/gallon	\$ 840
Metals									
Copper	CP	COMEX	1,3,5,7,9,12	9:50-2:00	25,000 lb	\$.0005/lb	\$12.50	\$.05/lb	\$1,250
Gold	GK	CBT	2,3,4,6,8,10,12	9:00-2:30	32.15 troy oz	\$.10/oz	\$ 3.22	\$50.00/oz	\$1,607.50
Palladium	PA	NYMEX	3,6,9,12	9:00-2:20	100 troy oz	\$.05/oz	\$ 5.00	\$ 6.00/oz	\$ 600
Platinum	PL	NYMEX	1,4,7,10	9:10-2:30	50 troy oz	\$.10/oz	\$ 5.00	\$25.00/oz	\$1,250
Silver	SV	COMEX	1,3,5,7,9,12	8:05-1:25	5000 troy oz	\$.001/oz	\$ 5.00	\$.50/oz	\$2,500

/A CBT - Chicago Board of Trade; CME - Chicago Mercantile Exchange; COMEX - Commodity Exchange, Inc. (New York);
CSCE - Coffee, Sugar, and Cocoa Exchange (New York);
NYCE - New York Cotton Exchange; NYMEX - New York Mercantile Exchange.

/B Times quoted are as of July 1986.

/C Figures reported are as of July 1986.

Table 3 - Immediate and Lagged Commodity Responses Macroeconomic News, Period 01/02/85 - 09/30/86

Commodity	US	UPPI	UCPI	UIP	UIR	UIR	UER	UMS	UIPPI	UICPI	UIIP	UIUR	UIUR	UIER	F1	F2	F3	R2
FOODS & LIVESTOCK																		
Cocoa	-.47	.10	-1.94	.97	-.09	.01	-.47**	1.01*	.29	-.27	-1.02	-.05	-.06	.04	1.36	1.75*	.63	.911
t	.62	.10	-.63	.63	.70	.64	-3.24	1.80	.30	.09	-.66	.38	-.47	.25				
Coffee	.86	1.44	3.02	1.37	-.22	.01	-.17	-1.26	-.40	4.38	-.84	.23	-.002	.36*	.96	.85	1.19	-.001
t	1.11	1.06	.72	.66	-1.27	-.43	-.88	-1.65	-.30	1.05	-.40	1.32	-.12	1.83				
Cattle (live)	.75	-1.33	1.67	.85	-.08	-.02*	-.29**	-.25	1.69**	-.61	-2.10	.16	.01	.20	1.74**	2.10**	1.42	.613
t	1.49	-1.52	.69	.63	-.71	-1.92	-2.17	-.50	1.94	-.23	-1.55	1.48	.92	-1.59				
Orange Juice	.20	.40	-3.66**	.88	-.03	-.001	.07	.24	2.89**	-.81	-1.89	.17	-.0001	-.03	1.31	.82	1.82*	.010*
t	.37	.44	-1.99	.62	-.28	-.07	.53	.57	3.14	-.28	-1.39	1.49	-.02	-.23				
Pork Bellies	.69	-1.17	.84	.07	-.004	-.02	-.23	-.17	.43	-2.76	-2.30	.10	.01	-.16	.71	.95	.52	-.079
t	.98	-.95	.22	.04	-.02	-1.54	-1.27	-.24	.35	-.73	1.21	.62	-.99	-.90				
Sugar	-1.13	.29	-1.80	3.71	.29	.009	.22	1.22	-.42	-7.89	.51	-.22	.03	-.38	.47	.43	.54	-.017
t	-.77	.11	-.23	.94	.88	.31	.59	.85	.16	-1.00	.38	-.67	.82	-1.03				
CROPS																		
Corn	.47	.84	.55	1.22	.15	-.02	-.10	-.89	-1.13	-.40	-1.42	.11	.006	-.008	.19	.22	.16	-.027
t	.35	.36	.08	.34	.52	-.88	-.29	-.67	-.48	-.06	-.39	-.37	.22	-.02				
Cotton	.36	-.14	3.37	.16	-.16	-.01	-.16	.42	.06	-.62	-1.93	.22	.02	.37	.29	.19	.40	-.013
t	.27	-.05	.75	.05	-.54	-.41	-.47	.33	.03	-.09	-.54	.76	.76	1.12				
Soybeans	-.50	-1.96	-3.03	2.34	.45	-.03	-.74	19.11*	.31	-3.56	-6.30	-.17	.23	-2.82	.42	.02	.82	-.019
t	-.05	-.11	-.06	.09	.20	-.12	-.29	1.95	.02	-.07	-.23	-.08	1.09	-1.12				
Soy Meal	.11	-1.48*	-.43	1.32	-.02	-.005	-.14	-.06	.34	-.35	-3.10**	-.02	.02	-.06	.99	.85	1.14	-.0003
t	.24	-1.84	-.17	1.22	-.17	-.54	-1.23	-.13	.42	-.14	-2.49	-.23	-1.98	-.56				
Soy Oil	-.44	1.31	-.77	.32	.03	-.01	.007	-.14	.73	-4.70	-.46	.34**	.01	-.03	.84	.37	1.35	-.005
t	-.73	1.24	-.23	.19	.19	-.36	.05	-.23	.69	-1.44	-.28	2.57	-.79	-.19				
Wheat	-.50	.32	-.67	-.81	.17	-.005	-.25*	-.11	-.30	-1.05	-.59	.11	.02*	-.12	.64	.84	.67	-.012
t	-.85	.31	-.21	-.51	1.34	-.42	-1.67	-.19	-.30	-.33	-.37	.88	1.82	-.81				
ENERGIES																		
Crude Oil	1.67	-.09	-10.05*	1.05	1.64**	.03	-.13	.007	.31	9.00	2.39	.18	-.03	.21	1.24	1.93*	.74	.017
t	1.51	-.04	-1.68	.35	-2.58	1.30	-.46	.006	.16	1.51	.80	.73	-1.29	.74				
Heating Oil (#2)	1.07	-1.80	-1.33	3.78	-.65**	.02	-.40	.01	-1.20	.84	.008	.12	-.02	.02	1.06	1.94*	.20	.002
t	.97	-.94	-.23	1.28	-2.69	.99	-1.45	.01	-.63	.14	.003	.48	-.75	-.07				
Gasoline (regular unleaded)	.17	-2.73*	-6.24*	1.69	-.39**	.01	-.22	-.45	-.97	.58	.27	.18	-.02	.004	.94	1.50	.41	-.002
t	.19	-1.70	-1.66	.68	-1.92	-.53	-.93	-.53	-.61	.12	.11	.89	-1.15	.02				
METALS																		
Copper	.07	-.72	1.04	-1.13	.07	.001	-.06	-.15	-.46	-1.55	-.086	.10	.002	-.24**	.97	.71	1.28	-.001
t	.20	-1.09	.51	-1.11	.79	.12	-.59	-.40	-.71	-.76	-.08	1.19	.02	-2.50				
Gold	.04	-.38	-1.72	.22	.16	-.0002	-.31**	.21	-.50	-2.51	.96	-.06	-.01	-.10	1.17	1.56	.59	.006
t	.10	-.50	-.73	.19	1.63	-.03	-2.76	.48	-.66	-1.07	.81	-.62	-.93	-.91				
Palladium	-.13	-1.27	3.60	1.10	.12	-.03**	-.33*	-.07	-.67	-8.09**	.14	-.005	.005	.22	1.37	1.69	1.03	.010
t	-.18	-1.03	.95	.98	.80	-2.17	-1.85	-.10	-.55	-2.14	.07	-.03	.35	1.27				
Platinum	.42	-1.78	-3.11	1.11	.15	-.01	-.31*	.36	-.34	-2.18	-.27	-.03	-.01	-.10	.70	1.07	.24	-.010
t	.59	-1.44	-.82	.98	.93	-.56	-1.72	.52	-.28	-.57	-.14	-.18	-.70	.56				
Silver	-.34	-.90	.05	1.81	-.02	.001	.06	-.73	-.32	-5.46*	-.37	-.03	-.02	-.04	.71	.33	1.10	-.009
t	-.59	-.91	.02	1.18	-.14	.05	.39	-1.31	-.32	-1.78	-.24	.22	-1.44	-.25				

Each equation has 439 observations.
 See the footnotes at the bottom of Table 2 for explanations.
 F1 and F2 each has 7 and 424 degrees of freedom.
 F3 has 14 and 424 degrees of freedom.

Table 4 - Immediate and Lagged Commodity Responses Macroeconomic News, Period 10/01/86 - 12/31/87

Commodity	UMS	UPPI	UCPI	UIP	UIR	UIR	UER	UMS	UPPI	UCPI	UIP	UIR	UIR	UIR	F1	F2	F3	F2
FOODS & LIVESTOCK																		
Onions	-.11	1.97	.52	1.97	-.16*	-.003	-.58**	-.22	.24	1.61	.78	.008	-.02**	.06	2.31**	3.44**	1.08	.055
t	-.33	.91	.21	1.39	-1.69	-.61	-4.35	-.67	.18	.67	.55	.08	-2.30	.42				
Coffee	-.33	.46	-3.44	-.48	-.09	.01	-.07	.27	-.21	-1.39	1.02	.14	-.006	.55**	.72	.40	1.03	-.013
t	-.60	.21	-.84	-.20	-.58	1.16	-.32	.46	.09	-.34	.42	.04	-.53	2.41				
Ottle (Live)	.08	1.28	-1.31	.67	-.17*	.006	-.42**	-.86**	.34	.40	.07	-.25**	.008	.02	1.88**	2.17**	1.97*	.038
t	.25	.96	-.54	.47	-1.78	.89	-3.09	-2.62	.25	.16	.05	-2.60	1.24	.16				
Orange Juice	.25	1.47	-1.03	2.12	.09	.02**	.20	.47	-.21	6.49**	.24	.01	-.002	.06	2.01**	2.44**	1.63	.043
t	.84	1.22	-.46	1.62	1.04	2.90	1.59	1.57	-.17	2.92	.18	.13	-.29	.48				
Pork Bellies	-.47	1.33	.66	1.41	.02	.02	-.14	-.96	4.44*	7.83	-.57	.33*	-.008	.044	.80	.40	1.23	-.079
t	-.73	.51	.14	.50	.01	1.18	-.53	-1.49	1.70	1.63	-.20	-1.71	-.61	.17				
Sugyr	1.15	4.64	1.44	-5.71	-.18	-.06	-2.18	-2.24	5.19	6.47	7.82	-.77	-.02	2.53	.22	.20	.25	-.036
t	.21	.21	.04	-.24	-.12	-.55	-.98	-.42	.24	.16	.33	-.48	-.17	1.15				
CROPS																		
Corn	-.52	-1.64	-.72	1.27	-.02	.03**	.0002	.58	-2.02	4.41	1.89	-.11	-.01*	.21	1.96**	1.92*	1.94*	.061
t	-1.29	-1.01	-.24	.72	-.18	3.14	.001	1.45	-1.24	1.48	1.07	-.93	-1.77	1.24				
Cotton	.14	-3.73*	2.77	-1.84	.10	.02**	.29	.23	.66	4.58	-.44	.15	.006	.22	1.11	1.63	.69	.075
t	.29	-1.91	.78	-.87	.68	2.13	1.44	.47	.34	1.28	-.21	1.04	.07	1.11				
Soybeans	-.22	-.96	-.54	.88	.007	.02**	.15	.12	-.95	-.07	3.63**	-.11	.02**	.06	2.56**	2.03**	2.68**	.065
t	-.74	-.81	-.24	.67	.09	3.34	1.18	.40	-.79	-.03	2.79	-1.19	-2.74	.48				
Soy Meal	-.03	-2.05	2.21	-.35	.05	.01	.27*	.27	-1.70	-5.82**	3.67**	-.13	-.02**	.11	2.07**	1.05	2.69**	.043
t	-.07	-1.31	.77	-.21	.43	1.46	1.68	.69	-.64	-2.01	2.16	-1.08	-2.48	.69				
Soy Oil	-.34	.29	.74	2.12	.03	.02**	.07	-.03	-2.23	4.26	5.80**	-.11	-.01*	-.15	2.37**	1.28	3.09**	.058
t	-.86	.18	.25	1.23	.23	2.54	.43	-.09	-1.40	1.45	3.36	-.97	-1.85	-.94				
Wheat	-.65*	1.88	.34	.52	-.14	.001	-.02	-.69*	-1.70	3.32	3.71**	-.33**	-.02**	.18	2.35**	.71	4.00**	.058
t	-1.82	1.30	.13	.33	-1.31	.20	-.14	-1.95	-1.12	1.25	2.38	-3.12	-2.58	1.26				
ENERGIES																		
Crude Oil	.73	-.72	2.83*	-.91	.05	-.003	.23	.43	2.01	2.02	-3.77*	.04	-.007	-.20	.54	.72	1.02	-.074
t	1.52	-.37	.80	-.91	.39	-.28	1.17	.91	1.04	.57	-1.80	.26	-.75	-1.01				
Heating Oil (#2)	1.13**	-1.59	1.48	-1.42	.02	-.005	.09	.52	.006	2.65	-3.42*	-.003	-.009	-.21	.98	1.01	.87	-.011
t	2.37	-.83	.42	-.69	.14	-.53	.47	1.10	.003	.75	-1.65	-.02	-.93	-1.09				
Gasoline (regular)																		
unleaded	1.03**	-1.05	1.23	-2.70	-.02	-.01	.22	.49	2.00	3.98	-1.79	.02	-.01	-.12	1.36	1.57	1.01	.016
t	2.43	-.61	.39	-1.45	-.15	-.96	1.25	1.15	1.17	1.28	-.96	.14	-1.08	-.68				
METALS																		
Copper	.35	-1.83	.59	-.40	.13	.04**	-.23	.24	1.60	-.14	2.50	-.29**	.02*	.31*	3.03**	3.67**	2.06**	.073
t	.77	-.99	.18	-.20	.98	4.80	-1.24	.53	.86	-.04	1.25	-2.11	1.67	1.65				
Gold	.17	.31	.57	-1.94	.12	.005	-.31**	.06	-.43	-.68	-.32	-.04	.0	.32**	1.20	1.50	1.00	.079
t	.54	.26	.25	-1.41	1.40	.79	-2.41	.19	-.34	-.29	-.23	-.42	.01	2.52				
Palladium	.88*	-1.16	-1.68	-2.38	.20	.01	-.30**	.21	-1.14	5.60	.97	-.10	.03**	.61**	2.68**	2.05**	3.23**	.070
t	1.88	-.61	-.48	-1.16	1.45	1.49	-2.59	.44	-.61	1.80	.47	-.88	2.89	3.17				
Platinum	.70	.25	.0	-2.37	-.01	.02*	-.49**	-.18	-1.99	.37	-1.90	-.15	.01	.69**	1.87**	1.68	2.21**	.038
t	1.41	.12	.0	-1.01	-.04	1.73	-2.36	.37	-.99	.10	-.88	-1.04	.35	3.36				
Silver	.99	1.92	.73	-6.92**	.31	.02	-.74**	-.14	-1.18	7.15	1.70	-.22	.01	.91**	2.57**	2.91**	2.41**	.066
t	1.51	.73	.15	-2.43	1.61	1.54	-2.74	-.22	-.45	1.48	0.60	-1.14	.70	3.40				

Each equation has 354 observations.
 See the footnotes at the bottom of Table 2 for explanation.
 F1 and F2 each has 7 and 339 degrees of freedom.
 F3 has 14 and 339 degrees of freedom.

Table 5 - Immediate and Lagged Individual Responses Macroeconomic News, Period 01/02/88 - 05/31/89

Commodity	UNS	UUPI	UCPI	UIP	UIR	UIR	UIR	UIRS	UIRPI	UIRPI	UIRPI	UIRPI	UIR	UIR	UIR	F1	F2	F3	R2
FOODS & LIVESTOCK																			
Cocoa	-1.62**	.49	-1.06	-4.84	-.09	-.008	-.17	-.47	-.81	2.45	-4.95	-.15	.01	.07	1.13	1.41	.79	.005	
t	-2.31	.28	-.34	-1.48	-.57	-.47	-.69	-.67	-.46	.75	-1.53	-.94	.63	.30					
Coffee	.13	-2.89*	-3.39	-4.16	-.03	-.01	.04	.70	-1.51	-.59	-.12	.22	.01	-.14	1.09	1.37	.82	-.011	
t	.27	-1.94	-1.29	-1.50	-.21	-.70	.19	1.17	-1.02	-.23	-.04	1.63	.86	-.70					
Cattle (Live)	-.32	.21	.61	.02	-.04	-.005	.09	.19	-.41	-.31	-2.75	-.12	.02	.07	.72	.25	1.12		
t	-.84	.22	.36	.01	-.47	-.53	.66	.50	-.43	-.18	-1.55	-1.39	1.64	.56					
Orange Juice	-.19	-.57	2.86	-.78	.02	-.004	.19	-.83*	1.67	.02	-4.09**	-.08	-.004	.01	1.15	.66	1.60	.006	
t	-.44	-.52	1.49	-.38	.24	-.35	1.25	-1.90	1.53	.01	-2.04	-.76	-.37	.08					
Pork Bellies	.27	-.92	.73	-2.82	-.05	-.02	.10	-1.31	-2.13	-2.78	-4.51	.04	-.007	.76*	.49	.13	.82		
t	.21	-.29	.13	-.47	-.18	-.64	.22	-1.01	-.66	.49	-.76	.13	-.22	1.76					
Sugar	1.39	-2.22	.32	-6.30	-.12	-.02	.58	.89	2.44	-2.75	-2.56	.15	-.05	.31	.44	.48	.49	-.023	
t	.96	-.62	.05	-.94	-.37	-.46	1.15	.62	.67	.43	-.39	.44	-1.30	.64					
CROPS																			
Corn	.67	-.12	-.91	4.30	.25*	-.007	.04	.35	.07	-2.33	-4.17	.03	-.01	.12	.94	1.10	.65	-.002	
t	1.10	-.08	-.34	1.51	1.79	-.46	.19	.57	.05	-.87	-.23	.23	-.96	.58					
Cotton	-.28	.44	2.54	4.76**	-.01	-.02	.08	.14	.17	.57	-2.30	.13	.01	.05	.86	1.31	.52	-.005	
t	-.60	.37	1.23	2.19	-.08	-1.60	.52	.30	.15	.28	-1.07	1.25	.99	.30					
Soybeans	.45	-1.44	-1.23	4.54	.32	.005	-.08	.34	-.04	1.07	2.40	.04	.004	-.04	.80	1.39	.19	-.008	
t	.76	-.96	-.46	1.62	2.32	.34	-.38	.57	-.03	.40	-.87	.28	.26	-.22					
Soy Meal	.51	-.50	-1.63	5.27*	.32**	-.002	-.34	.26	.07	.36	-1.18	.09	.01	-.19	.95	1.68	.26	-.002	
t	.82	-.32	-.59	1.81	2.23	-.13	-1.57	.42	.04	.13	-.41	.34	.72	-.85					
Soy Oil	.68	-1.66	-.37	3.93	.16	.003	.13	.50	.34	.19	-4.10	.10	.003	-.11	.69	.92	.51	-.012	
t	1.13	-1.10	-.14	1.40	1.19	.18	.60	.89	.23	.07	-1.47	.71	.27	-.52					
Wheat	-.15	-.12	.65	4.29	.08	.001	.11	.63	-.83	-1.08	-2.91	.12	-.01	-.01	.61	.56	.60	-.016	
t	-.28	-.09	.27	1.68	.62	.05	.59	1.15	-.61	-.45	-1.15	.97	-.41	-.05					
ENERGIES																			
Crude Oil	.19	-.15	-1.38	-3.45	-.18	-.02	.62	.96	.36	-.44	-3.89	-.15	-.04**	-.47*	1.20	1.05	1.50	-.008	
t	.24	-.08	-.39	-.93	-1.0	-.84	.25	1.19	.18	-.12	-1.06	-.83	-2.06	-1.73					
Heating Oil (#2)	-.64	-.33	6.22**	-1.24	-.23	-.04**	.01	1.30*	1.08	-.06	-4.61	-.11	-.01	-.13	1.26	1.62	.95	.010	
t	-.92	-.19	2.03	-.38	-1.44	-2.19	.04	1.87	.62	-.02	1.44	-.69	-.01	-.57					
Gasoline (regular)																			
unleaded)	-.64	-.14	6.34*	.06	-.27	-.04*	.18	.18	1.02	1.22	-6.01*	-.25	.004	-.01	1.26	1.47	1.02	.010	
t	-.85	-.07	1.91	.02	-1.59	-1.95	.70	.70	1.35	.65	.74	-1.43	.24	-.05					
METALS																			
Copper	-1.53*	2.48	2.62	-4.09	-.20	-.003	.07	.45	-3.50	-.14	-1.84	-.20	.02	-.75**	1.40	1.0	1.75*	.016	
t	-1.75	1.14	.68	-1.01	-1.0	-.15	.24	.51	-1.60	-.04	-.46	-1.01	.15	-2.54					
Gold	.20	1.08	-.96	1.35	-.02	.01	-.04	.21	.16	-.15	-1.74	-.07	-.005	-.11	1.21	1.39	.88	.008	
t	.74	1.61	-.81	1.08	-.38	1.59	-.40	.77	.24	-.13	1.41	-1.15	-.82	-1.22					
Palladium	-.28	1.32	-1.85	.73	.18	.03**	-.18	1.07**	.62	-.73	.64	.07	-.001	-.02	1.50	1.86*	.87	.019	
t	-.58	1.07	-.85	.32	1.59	2.69	-1.07	2.16	.50	-.34	.28	.64	-.07	-.10					
Platinum	.36	1.88	-2.11	-.53	-.10	.005	-.14	.44	.09	-.54	-2.34	-.01	-.36**	.86	.73	.94	-.006		
t	.69	1.42	-.90	-.22	-.80	.37	-.76	.82	.07	-.23	-.96	-.06	.66	-2.02					
Silver	.56	2.06*	-1.56	.83	-.13	.01	.04	.31	-.06	-.56	-2.44	-.07	-.01	-.19	1.05	1.26	.74	.002	
t	1.21	1.79	-.76	.39	-1.22	.53	.26	.66	-.05	-.28-	1.15	-.64	-1.09	-1.22					

Each equation has 354 observations.
 See the footnotes at the bottom of Table 2 for explanations.
 F1 and F2 each has 7 and 339 degrees of freedom.
 F3 has 14 and 339 degrees of freedom.

Table 6 - Individual and Lagged Commodity Responses to Macroeconomic News over Various Periods

Commodity Group	UMS	UPPI	UCPI	UPP	UMR	UMR	UMR	UMS	UPPI	UCPI	UTP	UMR	UMR	UMR	R2
Period 01/01/85 - 05/31/89															
<u>FOODS & LIVESTOCK</u>	.02 .17	-.06 -.17	-.40 -.51	.36 .67	-.04 -1.21	.0003 .12	-.12 ^{***} -2.36	-.13 -.97	.77 ^{***} 2.25	.88 1.12	-1.19 ^{***} -2.31	.004 .12	.002 .61	.04 .97	.014
<u>CROPS & OIL</u>	-.11 .57	-.39 -.81	.02 .02	1.21 [*] 1.70	.06 1.32	.002 .60	.001 .01	.17 .86	-.26 -.35	-.41 -.38	.45 .63	.02 .31	-.004 -1.0	-.04 -.66	.008
<u>ENERGY</u>	.16 .42	-1.26 1.38	1.06 .30	.60 .44	-.26 ^{***} -2.75	-.005 -.59	-.02 -.13	.35 .95	.12 .15	.80 .38	-1.47 -1.07	-.03 -.27	-.01 -1.42	-.10 -.82	.015
<u>METALS</u>	-.03 -.18	.07 .16	-.03 -.03	-.54 -.86	.08 [*] 1.89	.005 1.25	-.19 ^{***} -1.50	.19 1.12	-.37 -.86	-1.14 -1.16	.29 .45	-.06 -1.45	-.0001 -.04	-.05 -.90	.020
Period 01/01/85 - 09/30/86															
<u>FOODS & LIVESTOCK</u>	.40 1.36	-.30 -.57	-1.20 -.75	.86 1.05	.004 -1.06	-.0008 -1.24	-.19 ^{***} -2.59	.13 .44	1.26 ^{***} 2.45	-.41 -.26	-1.59 ^{***} -1.99	.13 [*] 1.92	.005 .73	-.04 -.60	.037
<u>CROPS & OIL</u>	-.16 -.49	-.17 -.30	-.94 -.54	.49 .57	.05 .63	-.003 -.40	-.13 -1.54	.05 .16	.34 .60	-1.06 -.61	-1.70 [*] -1.95	.11 1.52	.01 ^{***} 2.12	-.05 -.69	.020
<u>ENERGY</u>	.35 .40	-2.36 -1.55	-5.86 -1.25	2.50 1.06	-.47 ^{***} -2.44	.02 1.06	-.21 -.97	-.37 -.43	-1.46 -.96	.98 .21	.35 .15	.13 .67	-.02 -1.17	-.06 -.29	0.31
<u>METALS</u>	-.03 -.10	-.30 -.55	-.19 -.11	-1.09 -1.30	.13 [*] 1.92	.0001 .02	-.71 ^{***} -2.14	-.01 -.05	-.41 -.75	-1.88 -1.12	.82 .97	.05 .68	.0002 .03	-.20 ^{***} -2.60	.032
Period 10/01/86 - 12/31/87															
<u>FOODS & LIVESTOCK</u>	-.03 -.20	1.30 [*] 1.92	-.96 .77	1.76 ^{***} 2.40	-.08 [*] -1.69	.006 [*] 1.93	-.22 ^{***} -3.20	-.14 -.85	.11 .16	2.48 ^{***} 1.99	.26 .35	-.04 -.81	-.01 -1.39	.07 .95	.055
<u>CROPS & OIL</u>	-.30 -1.29	-.61 -.65	.56 .32	.57 .36	-.02 -.29	.01 ^{***} 2.20	.19 ^{***} 1.97	-.07 -.29	-1.04 -1.80	1.26 .73	3.42 ^{***} 1.35	-.08 -1.14	-.01 ^{***} -2.58	.04 .45	.110
<u>ENERGY</u>	.87 ^{***} 2.21	-1.23 -.78	.52 .18	-1.92 -1.12	-.008 -.07	-.006 -.78	.26 1.64	.28 .72	2.42 1.54	3.89 1.34	-1.92 -1.12	.04 .30	-.004 -.47	-.25 -1.56	.043
<u>METALS</u>	.05 .22	-.90 -.92	-.34 -.11	.77 -.75	.08 1.14	.02 ^{***} 2.40	-.22 ^{***} -2.21	.06 .28	.77 .79	-1.32 -.73	-.30 -.29	-.08 -1.10	.007 1.51	.23 ^{***} 2.37	.096
Period 01/02/88 - 05/31/89															
<u>FOODS & LIVESTOCK</u>	-.12 -1.38	-.39 -1.02	.46 .45	1.69 -1.57	-.03 -.65	-.007 -1.26	.12 1.47	-.20 -.87	.008 .02	-.008 -0.008	-1.16 ^{***} -2.98	-.05 -.92	.004 .64	.01 .76	.031
<u>CROPS & OIL</u>	-.21 .59	-.17 -.20	1.27 .83	4.82 ^{***} 2.97	.09 1.10	-.009 -1.07	.04 .35	.26 .74	-.25 -.28	-.13 -.09	-2.80 [*] -1.74	.09 1.09	.008 .95	.004 -.03	.032
<u>ENERGY</u>	-.69 -.86	-.40 -.28	5.07 ^{***} 2.01	-1.15 -.43	-.25 [*] -1.91	-.03 ^{***} -2.19	.27 1.35	1.16 ^{***} 2.03	.63 .44	-.64 -.25	-6.01 ^{***} -2.29	-.19 -1.45	-.02 -1.24	-.05 -.79	.043
<u>METALS</u>	-.02 -.07	.91 1.48	-.47 -.44	1.45 1.26	.02 .33	.01 2.34	-.01 -.07	.29 1.15	.07 .11	-.03 -.27	-1.51 -1.32	-.08 -1.41	-.005 -.84	-.07 -.79	.040

See Table 2 for definition of variables.

Figure 1

Natural log of Industrial Production

Actual and Trend (Jan. 80 to May 89)

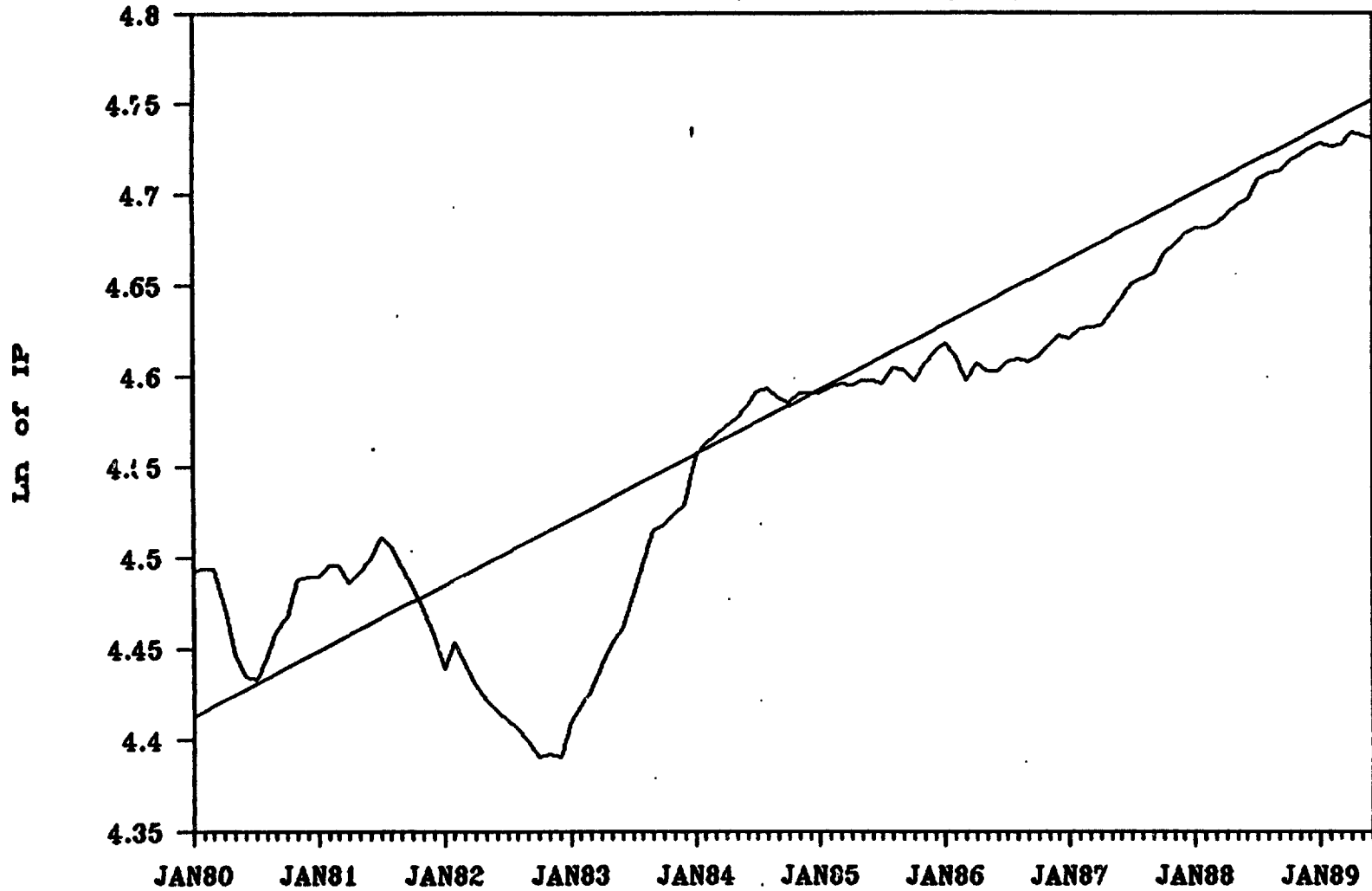


Figure 2

Natural Log of Industrial Production

Actual and Trend (Jan. 85 to June 89)

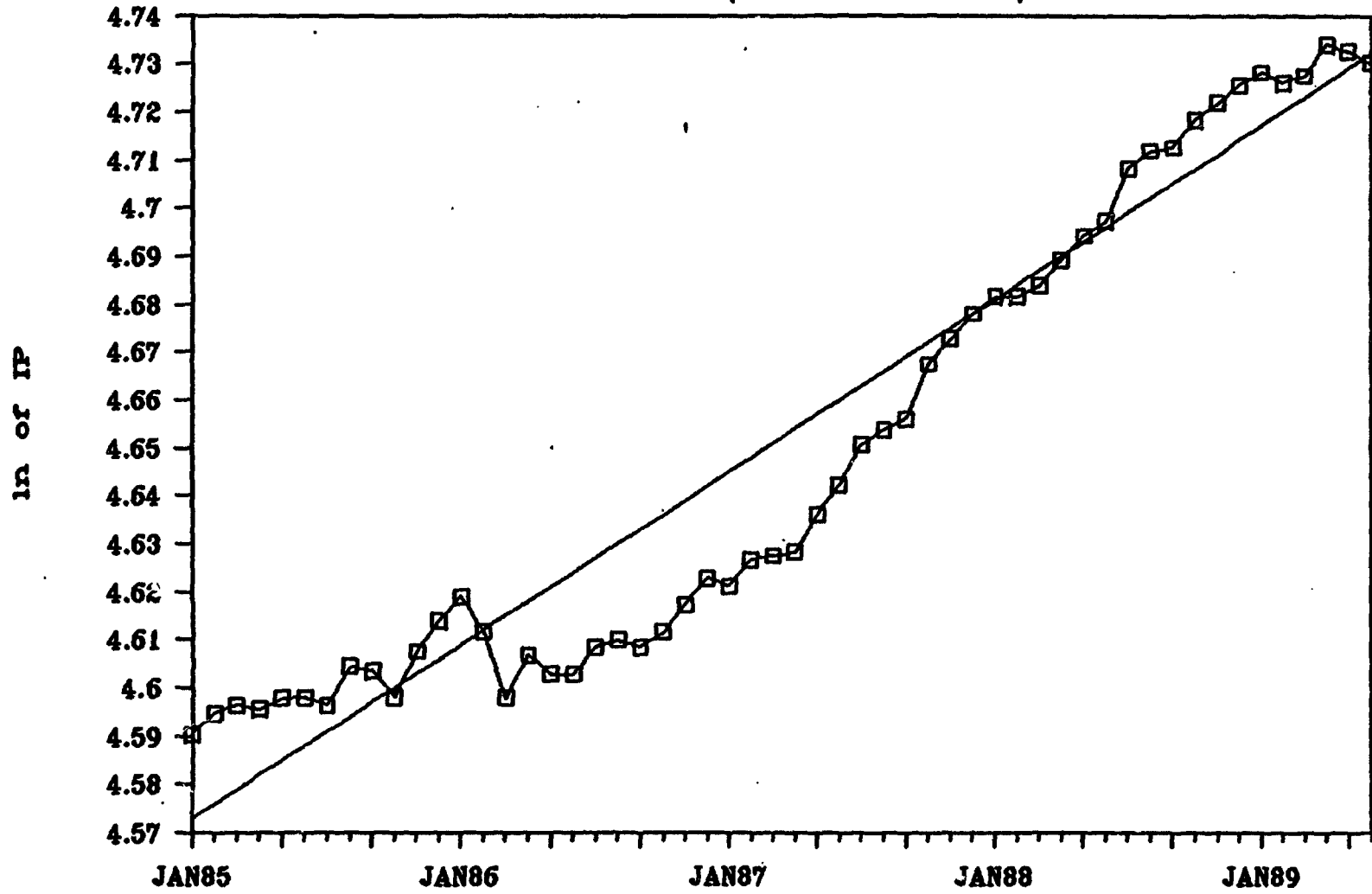


Figure 3

Exchange Rate Movements

(SDRs per U.S. dollar)

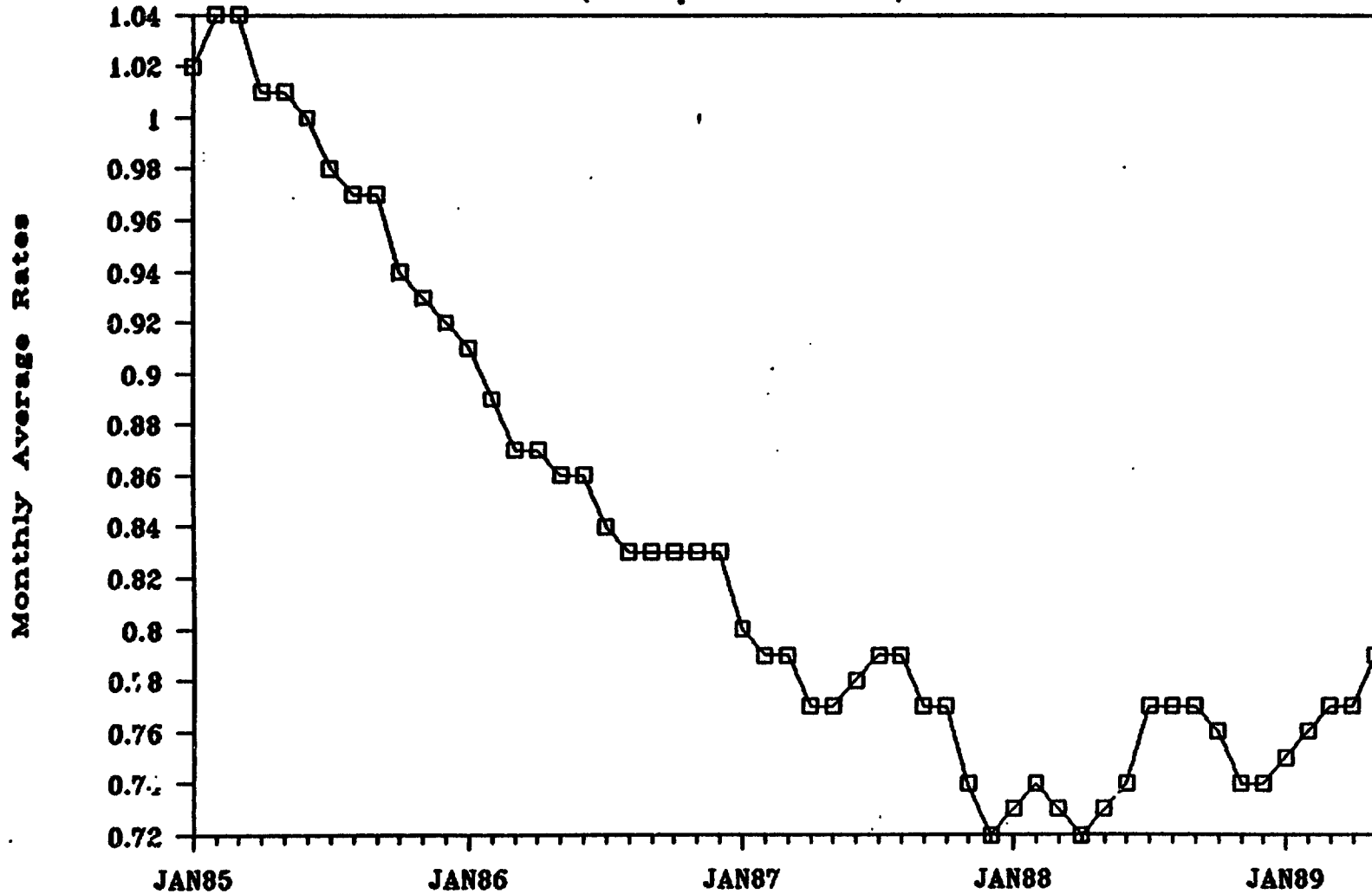


Figure 4

Cocoa Price Movements

(U.S. dollars per ton)

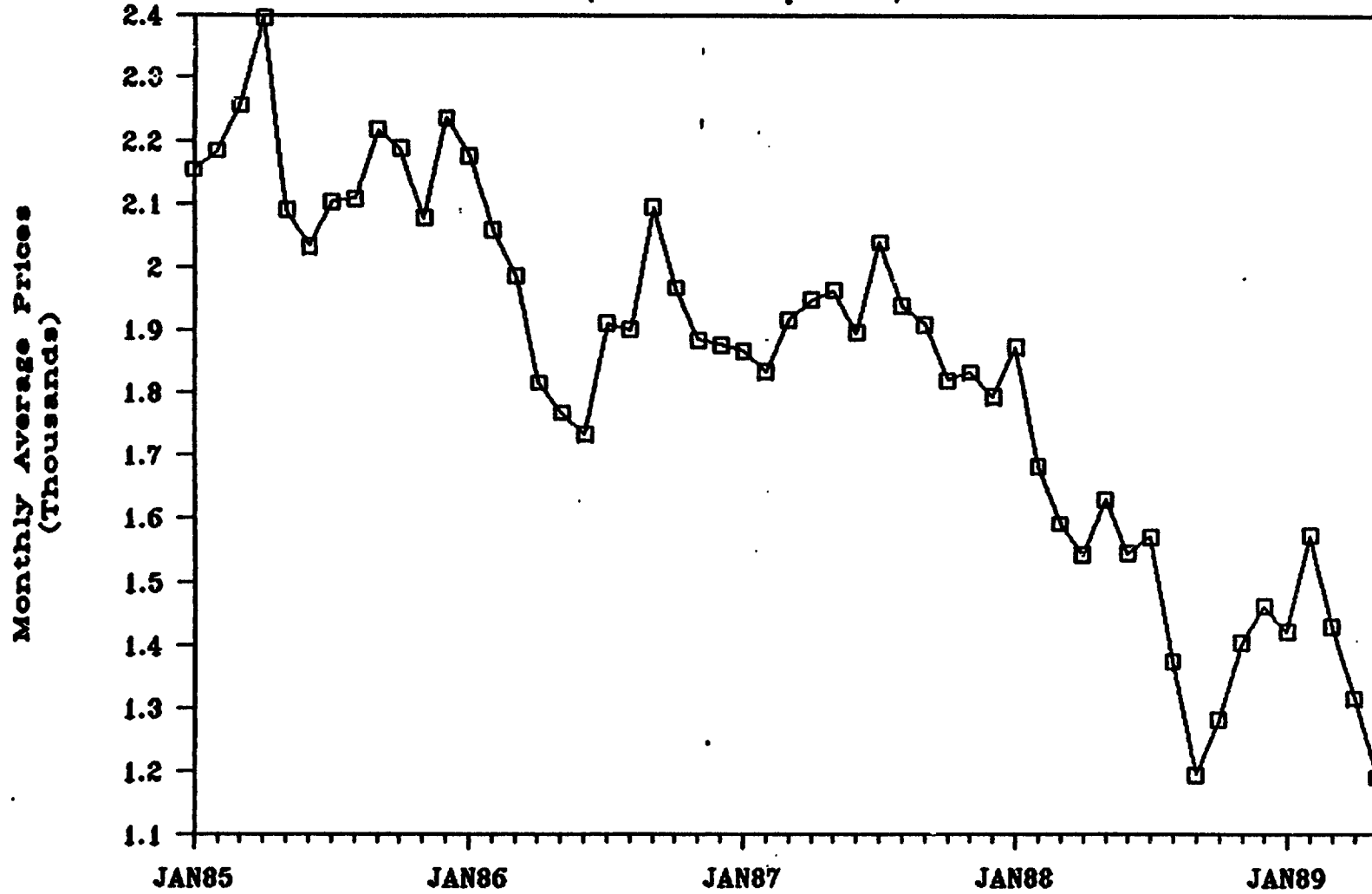


Figure 5

Coffee Price Movements

(U.S. cents per lb.)

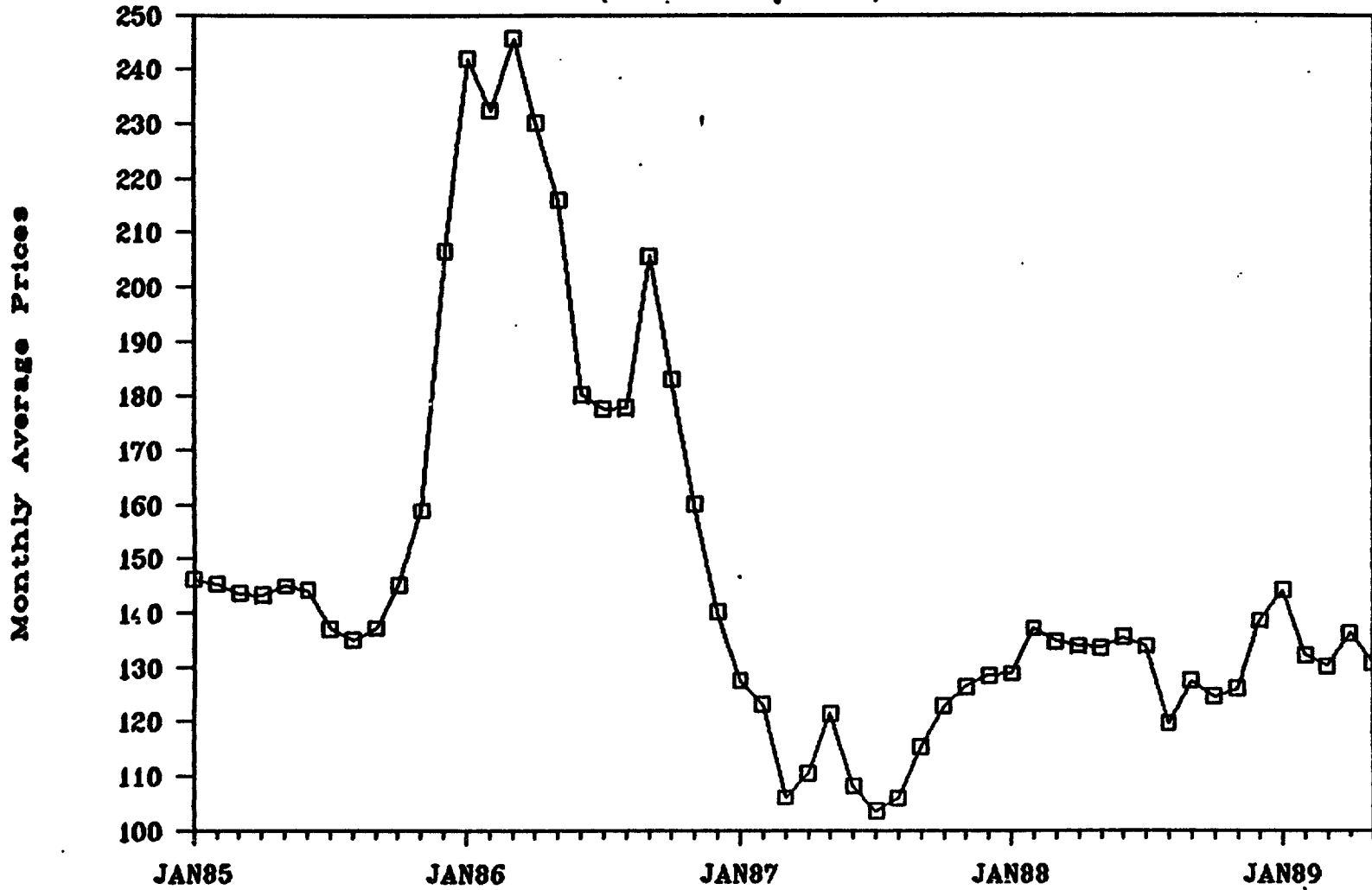


Figure 6

Live Cattle Price Movements

(U.S. cents per lb.)

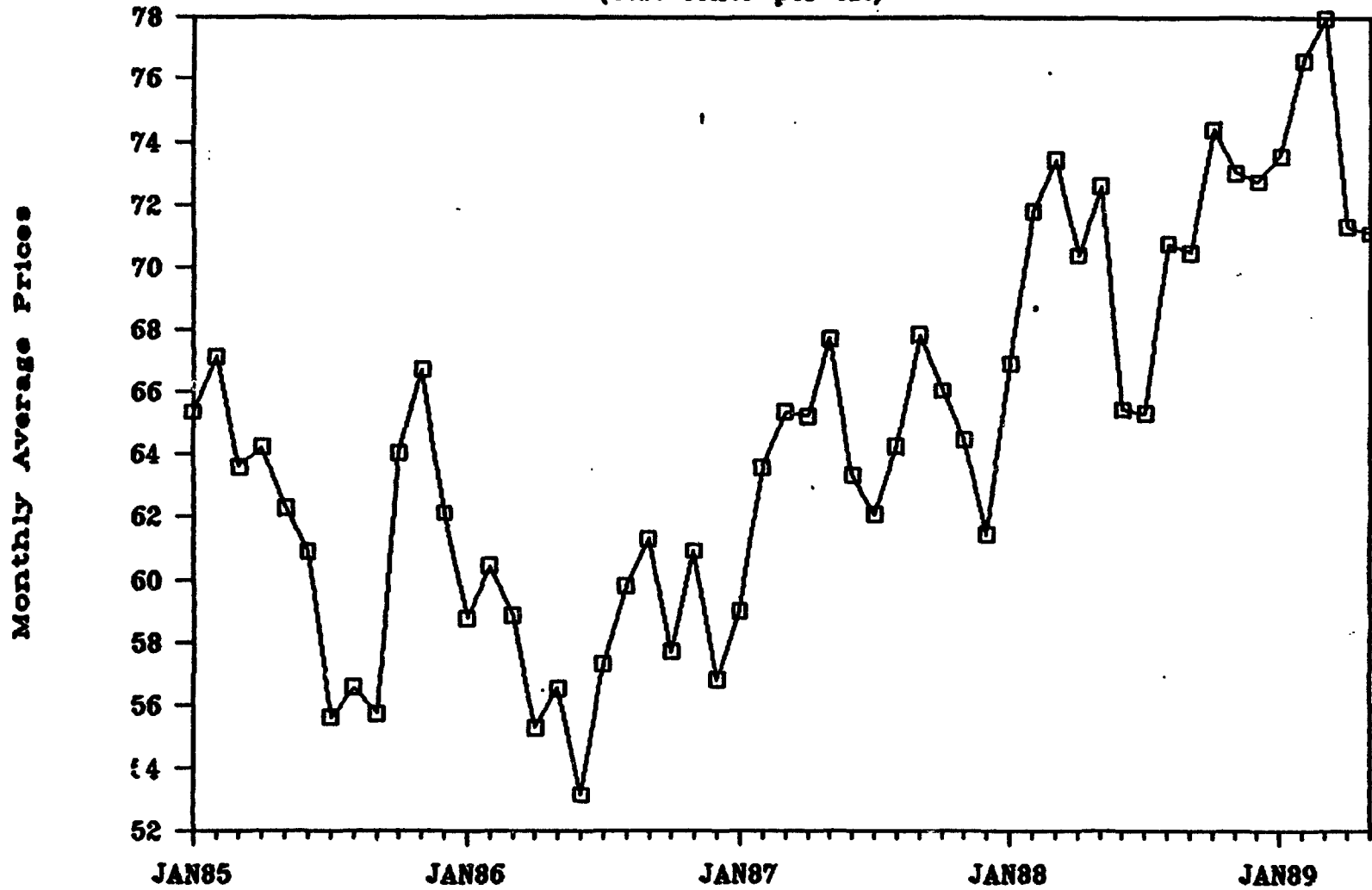


Figure 7

Orange Juice Price Movements

(U.S. cents per lb.)

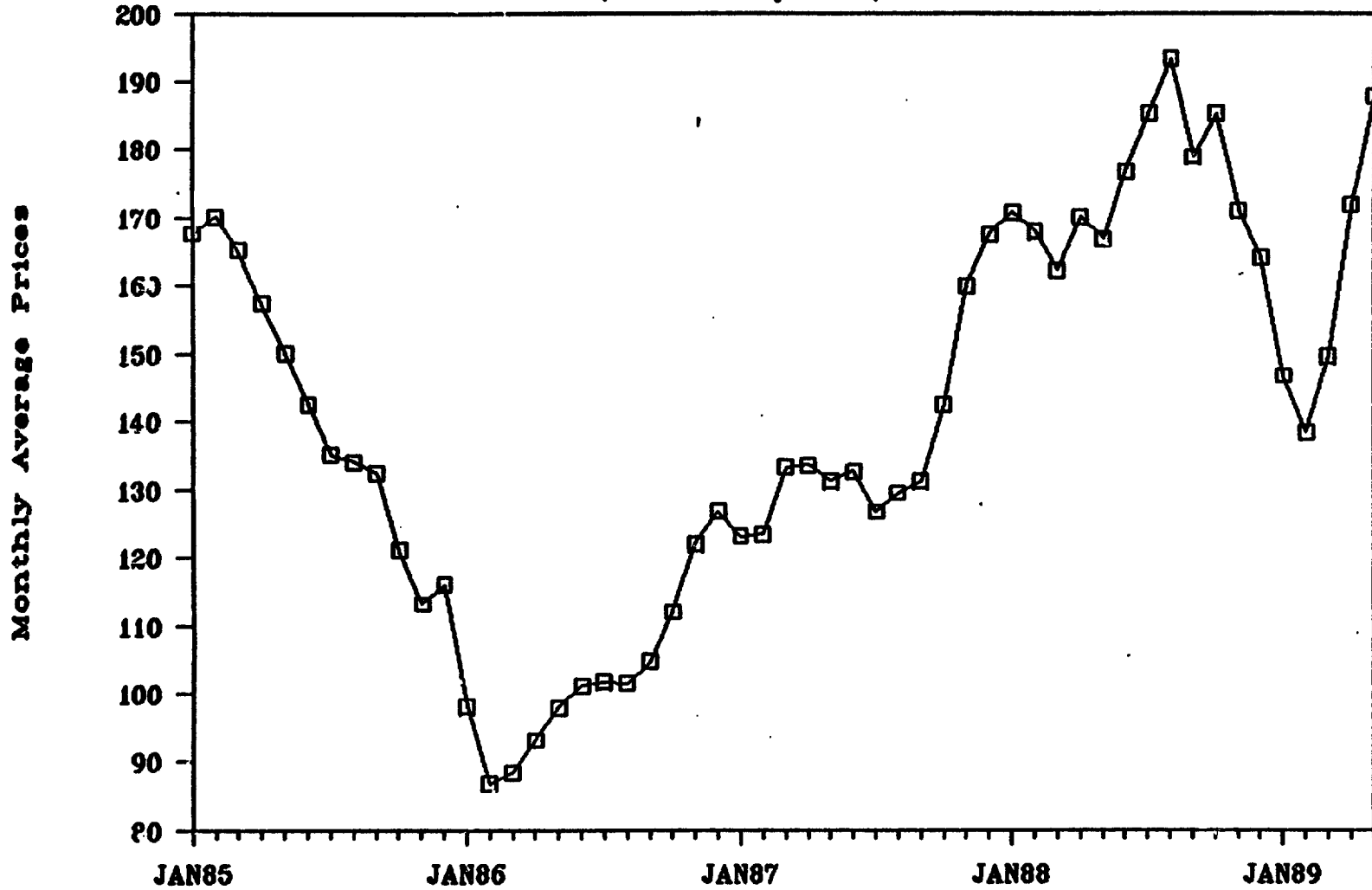


Figure 8

Pork Bellies Price Movements

(U.S. cents per lb.)

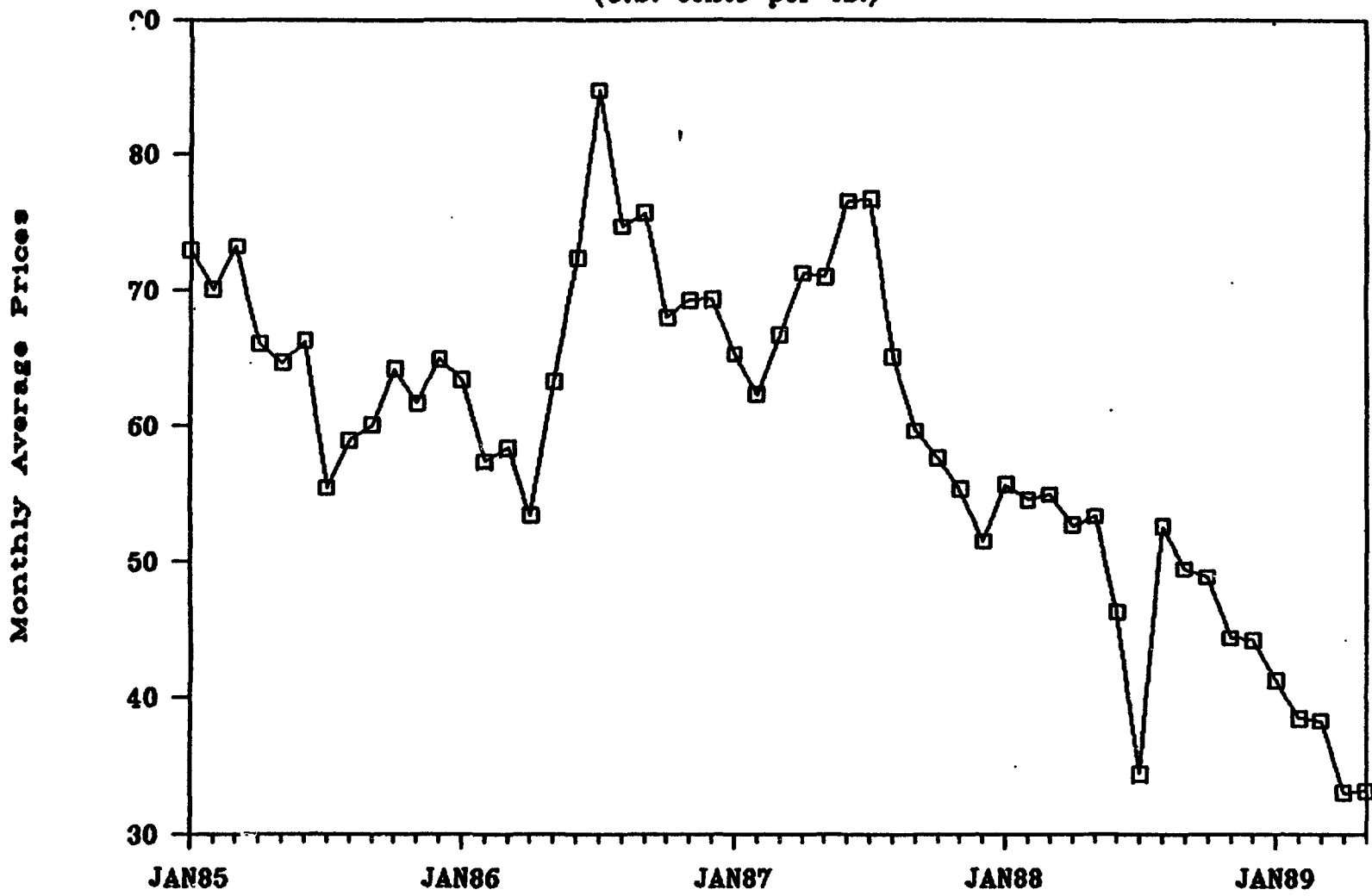


Figure 9

Sugar Price Movements

(U.S. cents per lb.)

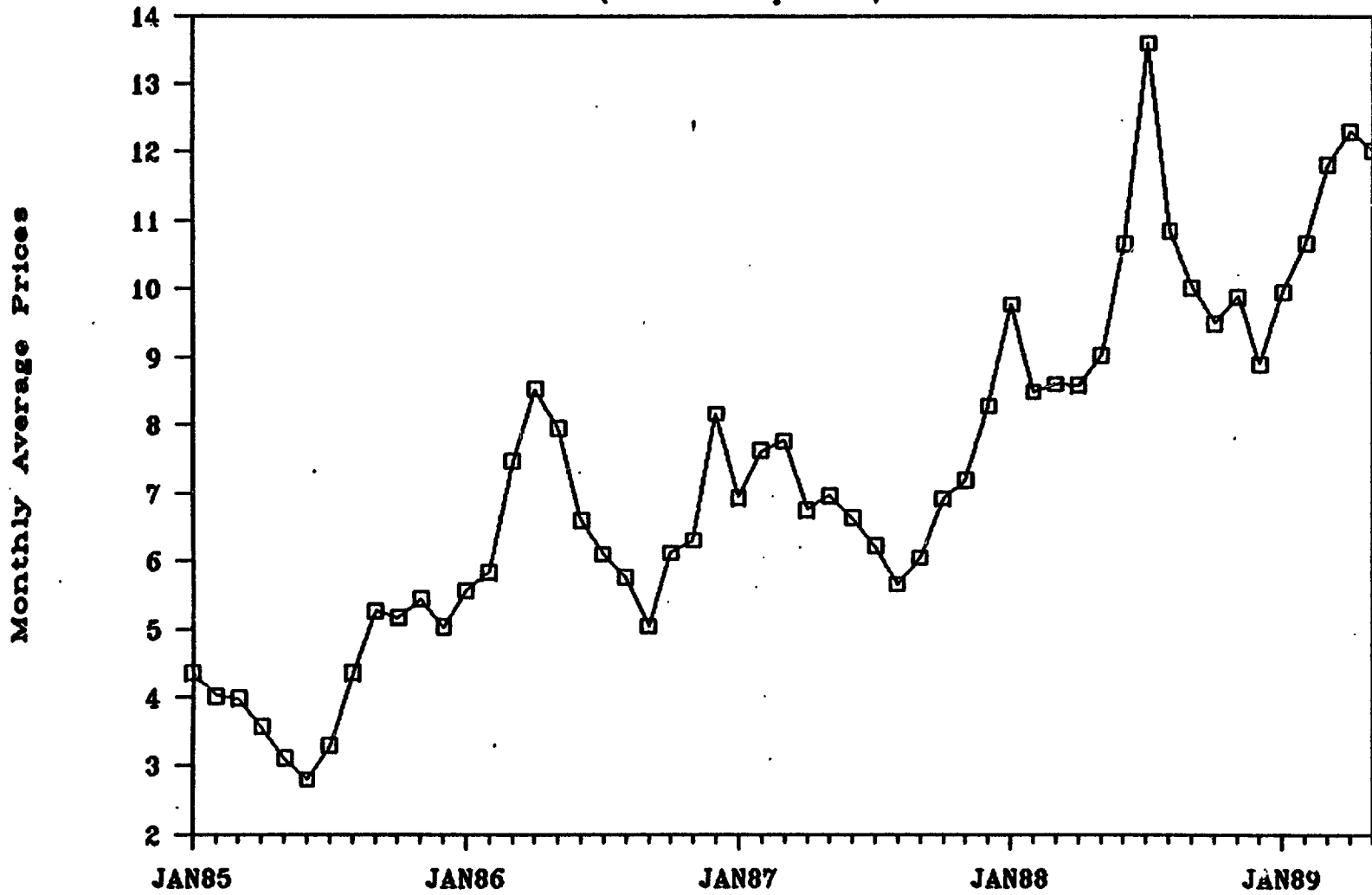


Figure 10

Corn Price Movements

(U.S. cents per bushel)

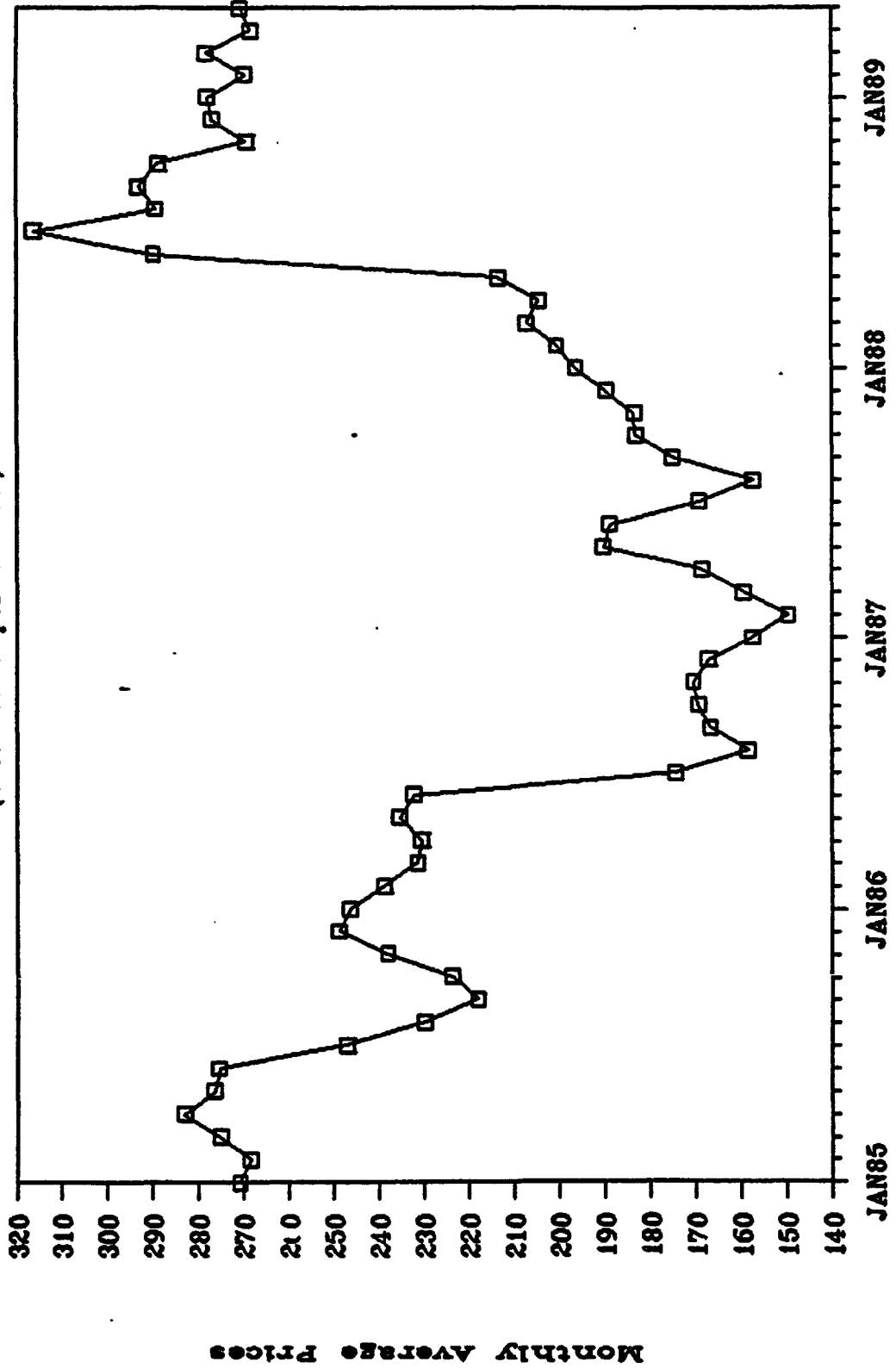


Figure 11

Cotton Price Movements

(U.S. cents per lb.)

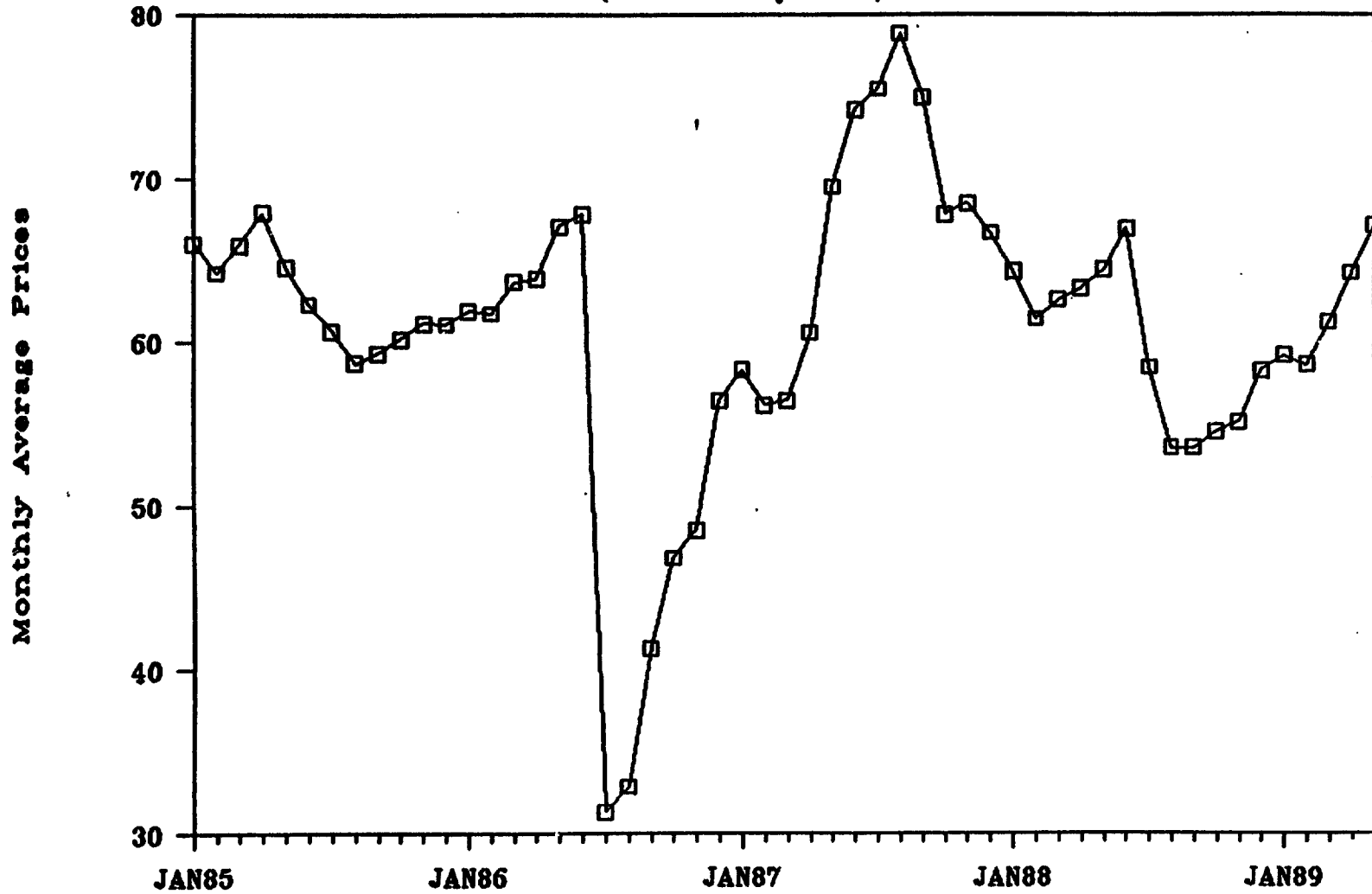


Figure 12

Soybean Price Movements

(U.S. cents per bushel)

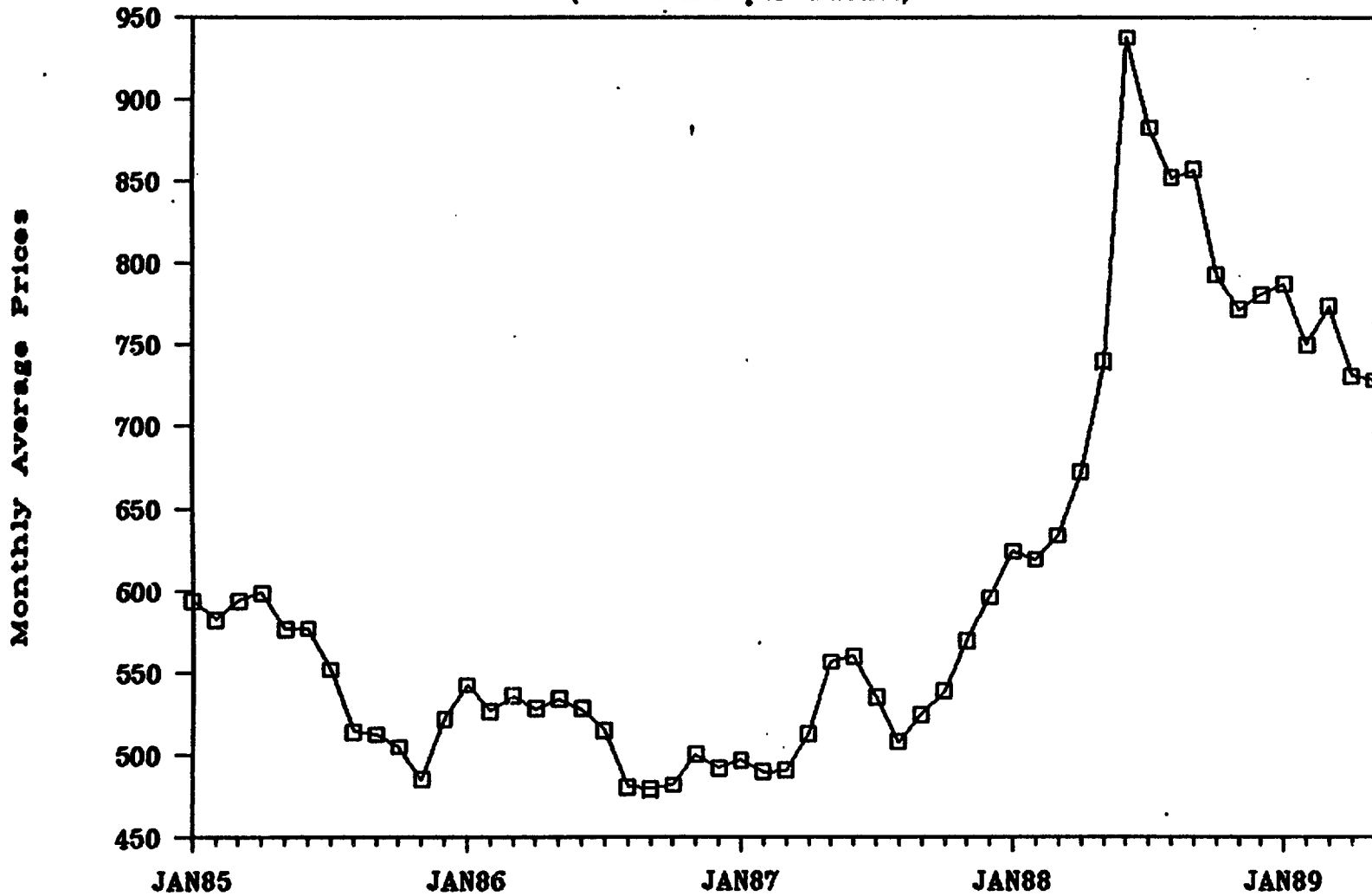


Figure 13

Soy Meal Price Movements

(U.S. dollars per ton)

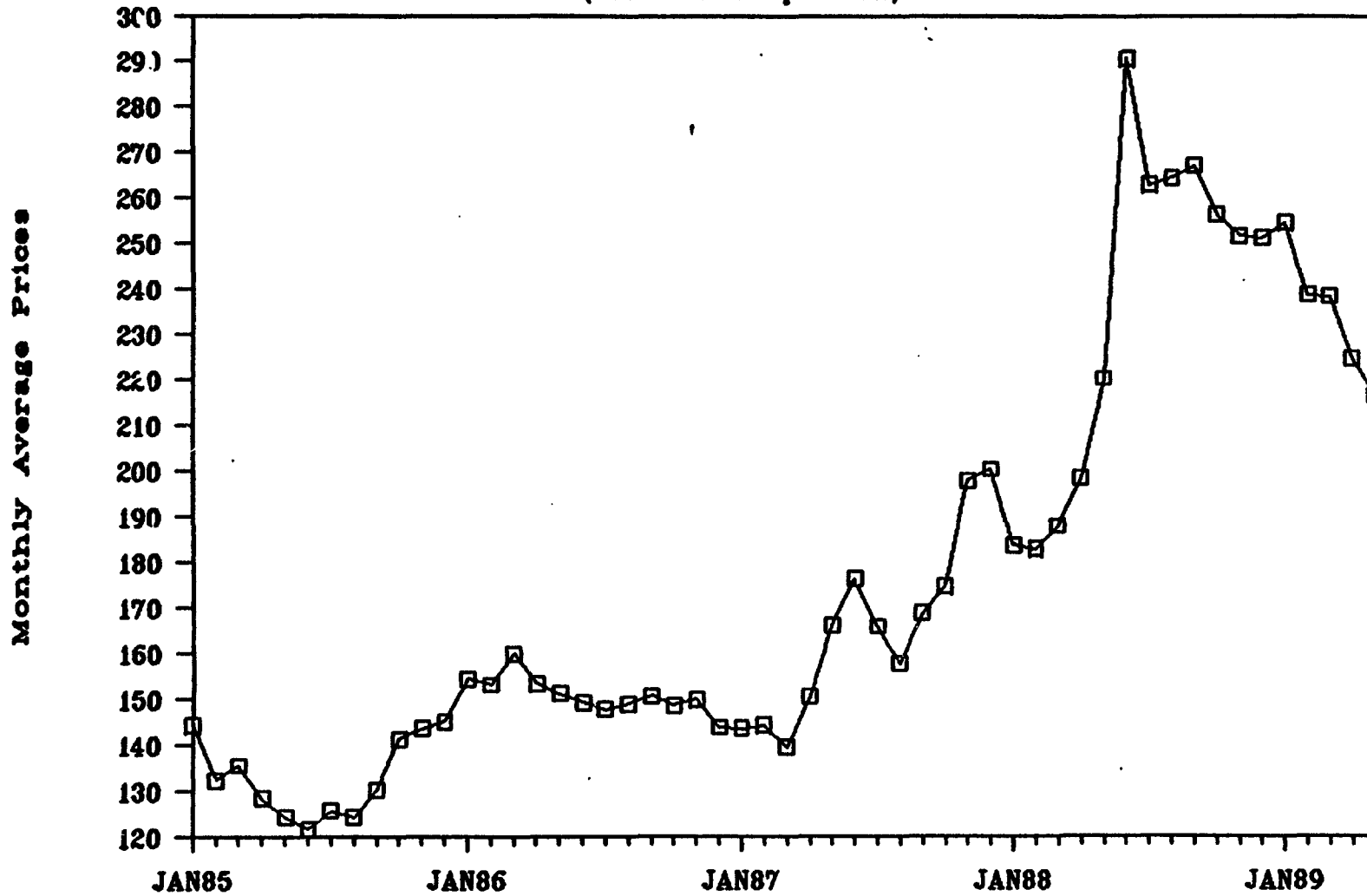


Figure 14

Soy Oil Price Movements

(U.S. cents per lb.)

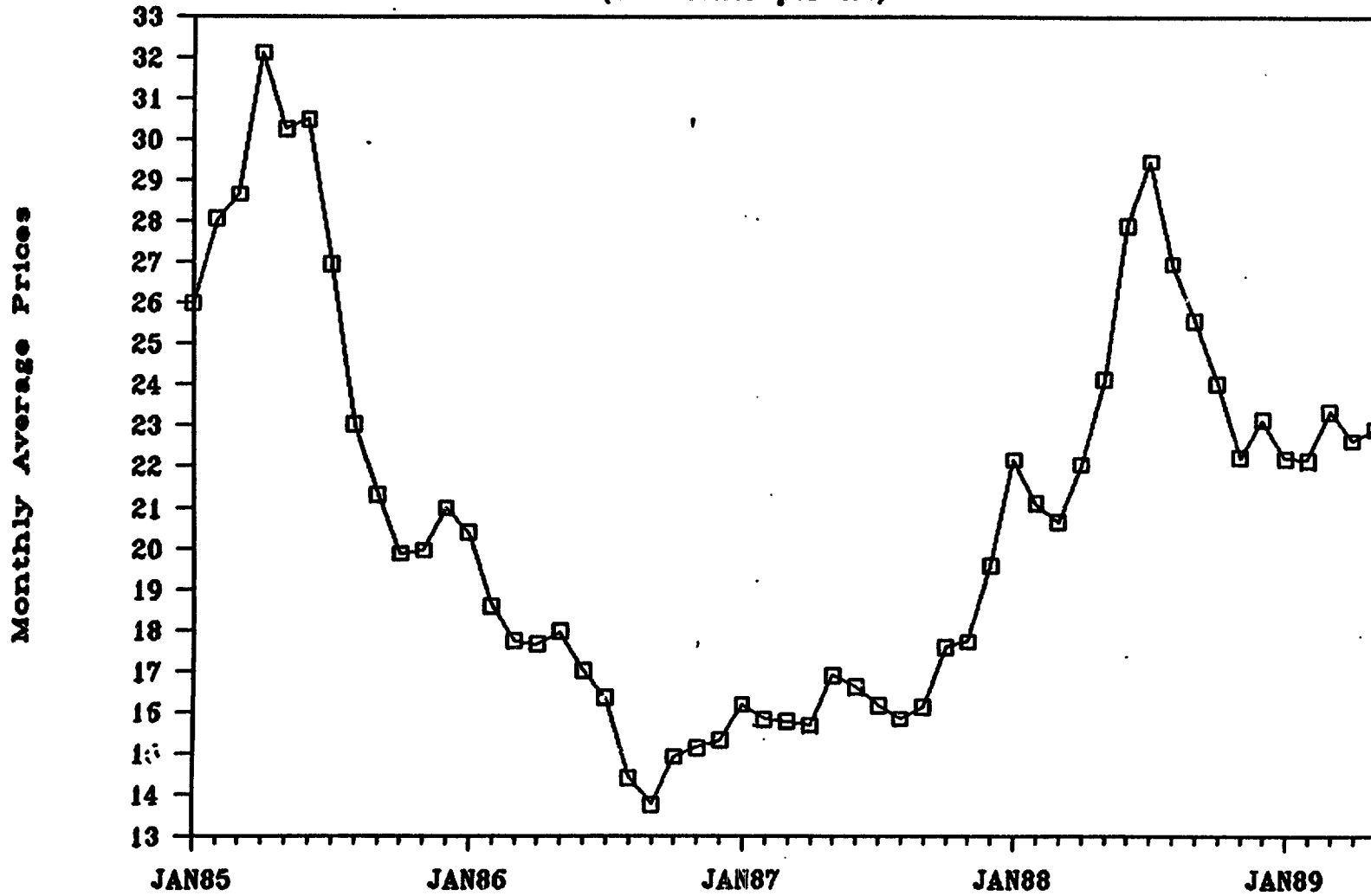


Figure 15

Wheat Price Movements

(U.S. cents per bushel)

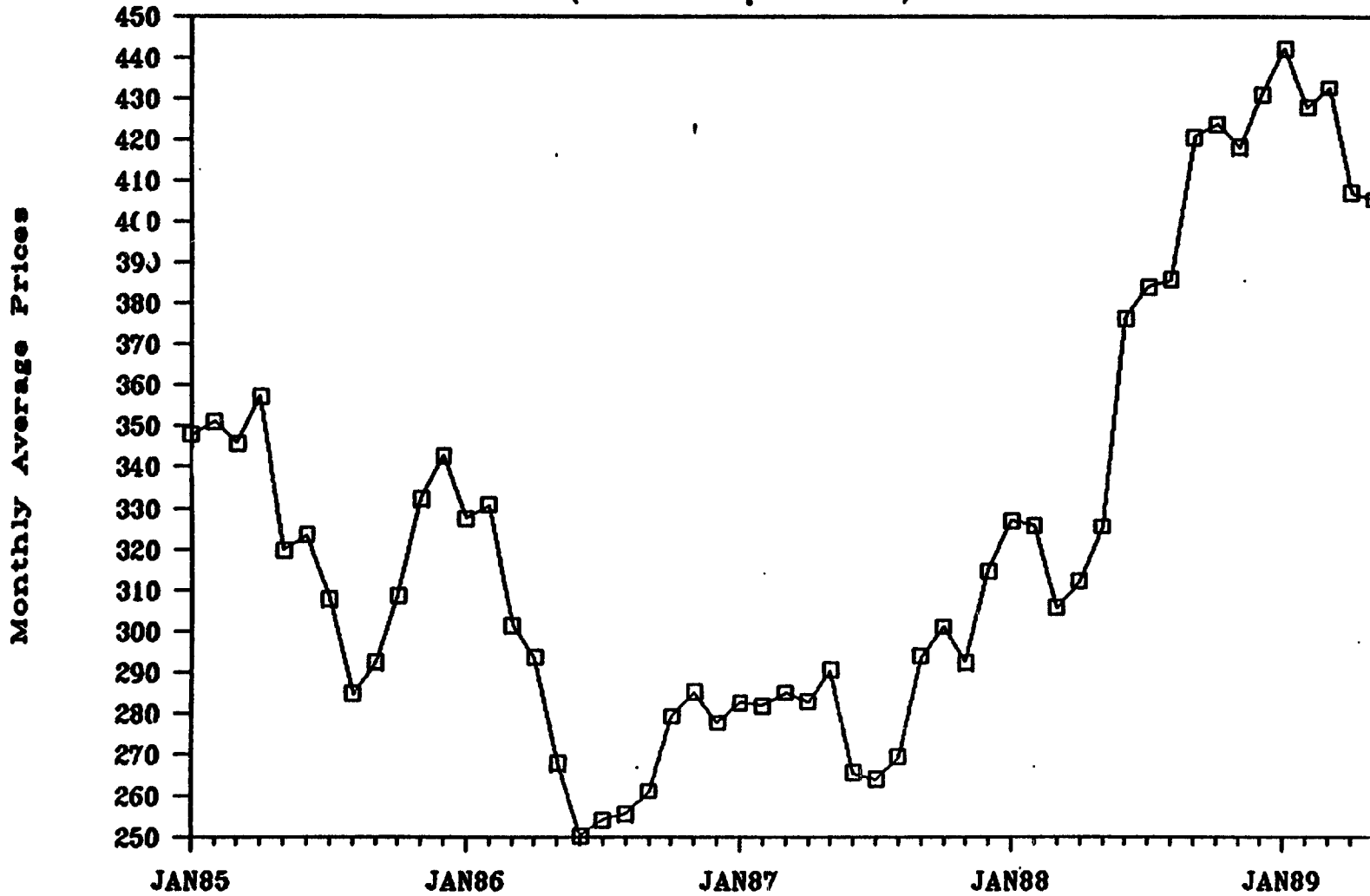


Figure 16

Crude Oil Price Movements (U.S. dollars per barrel)

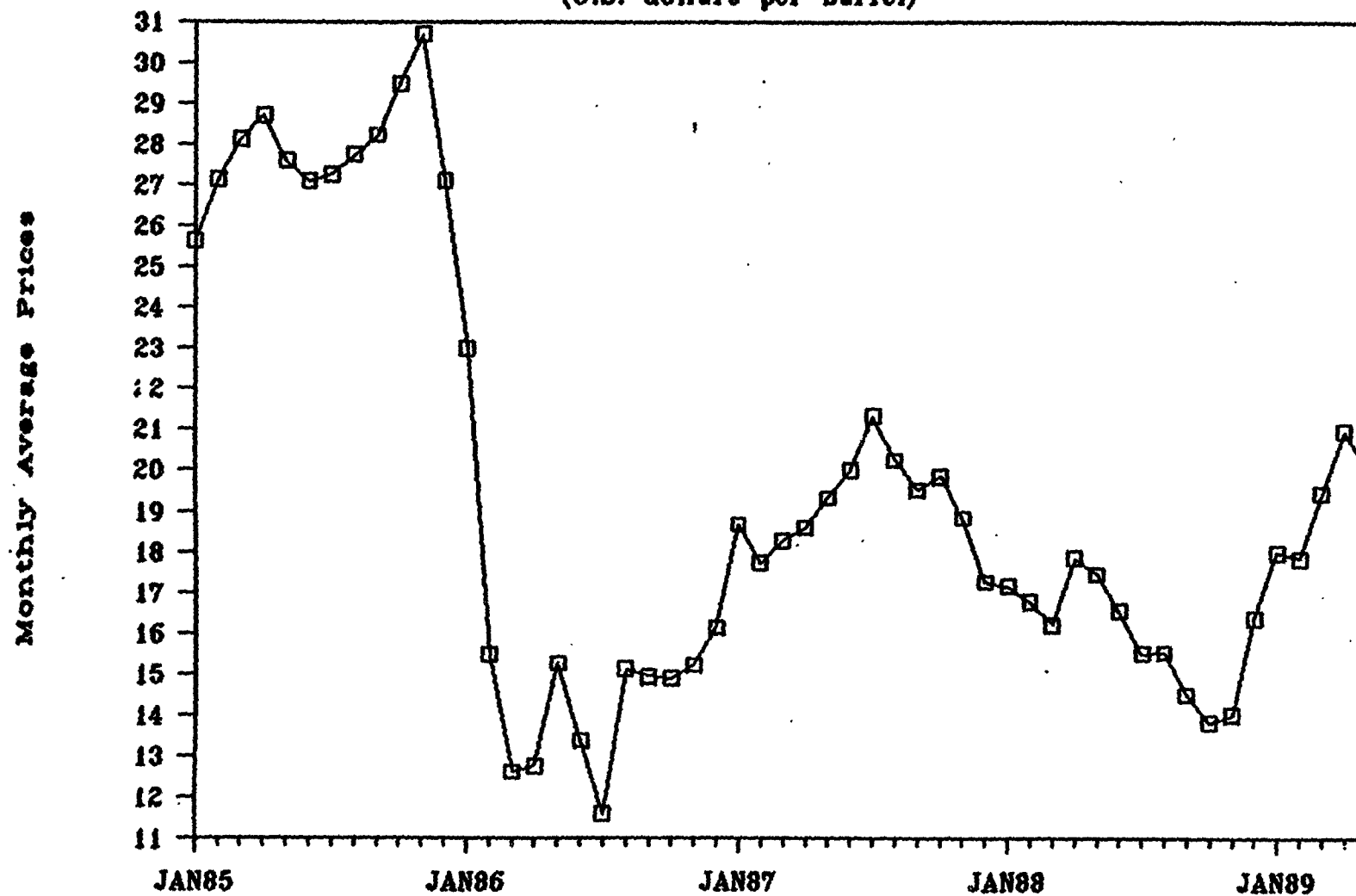


Figure 17

Heating Oil Price Movements

(U.S. dollars per gallon)

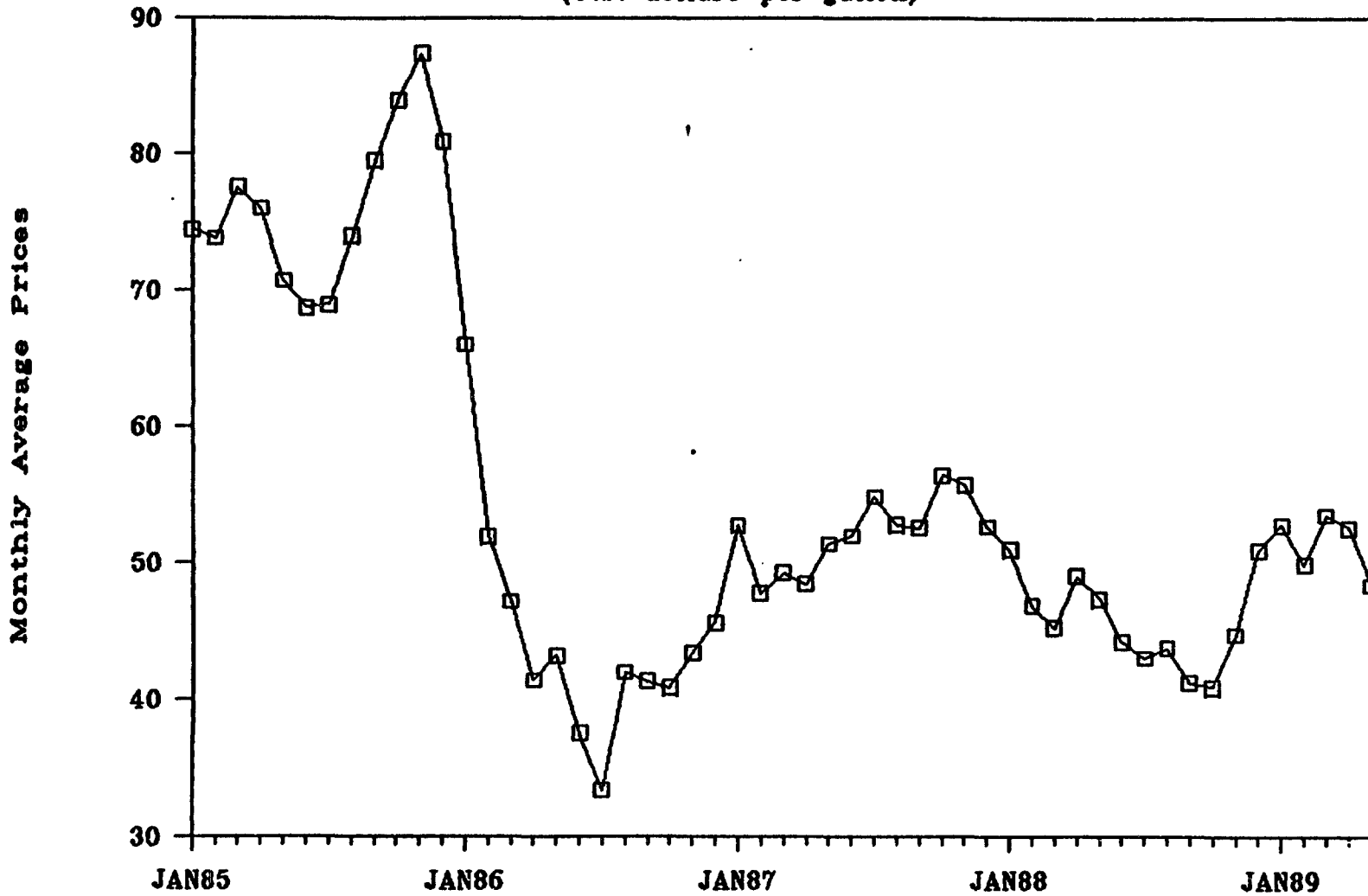


Figure 18

Gasoline Price Movements

(U.S. dollars per gallon)

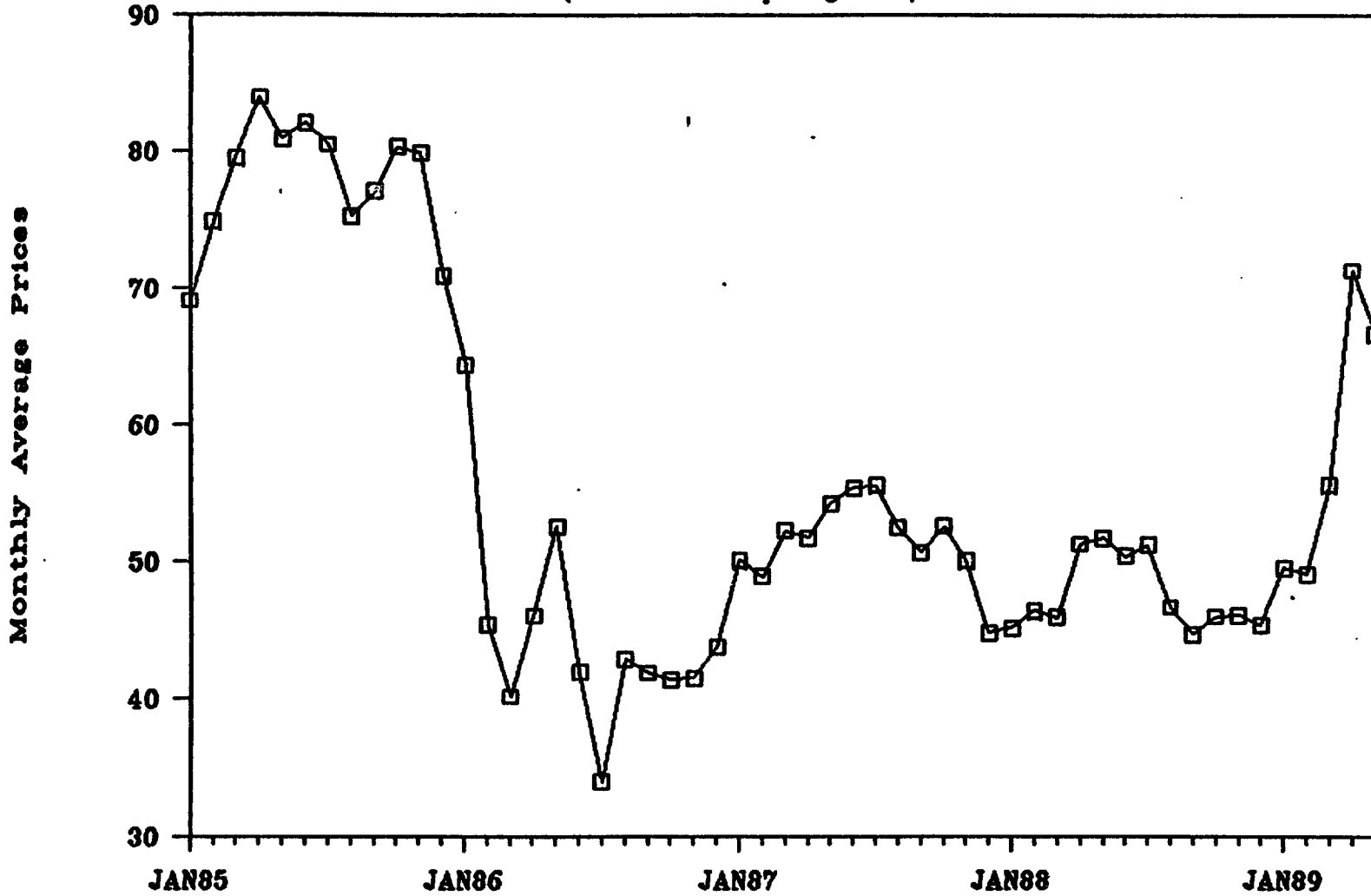


Figure 19

Copper Price Movements

(U.S. cents per lb.)

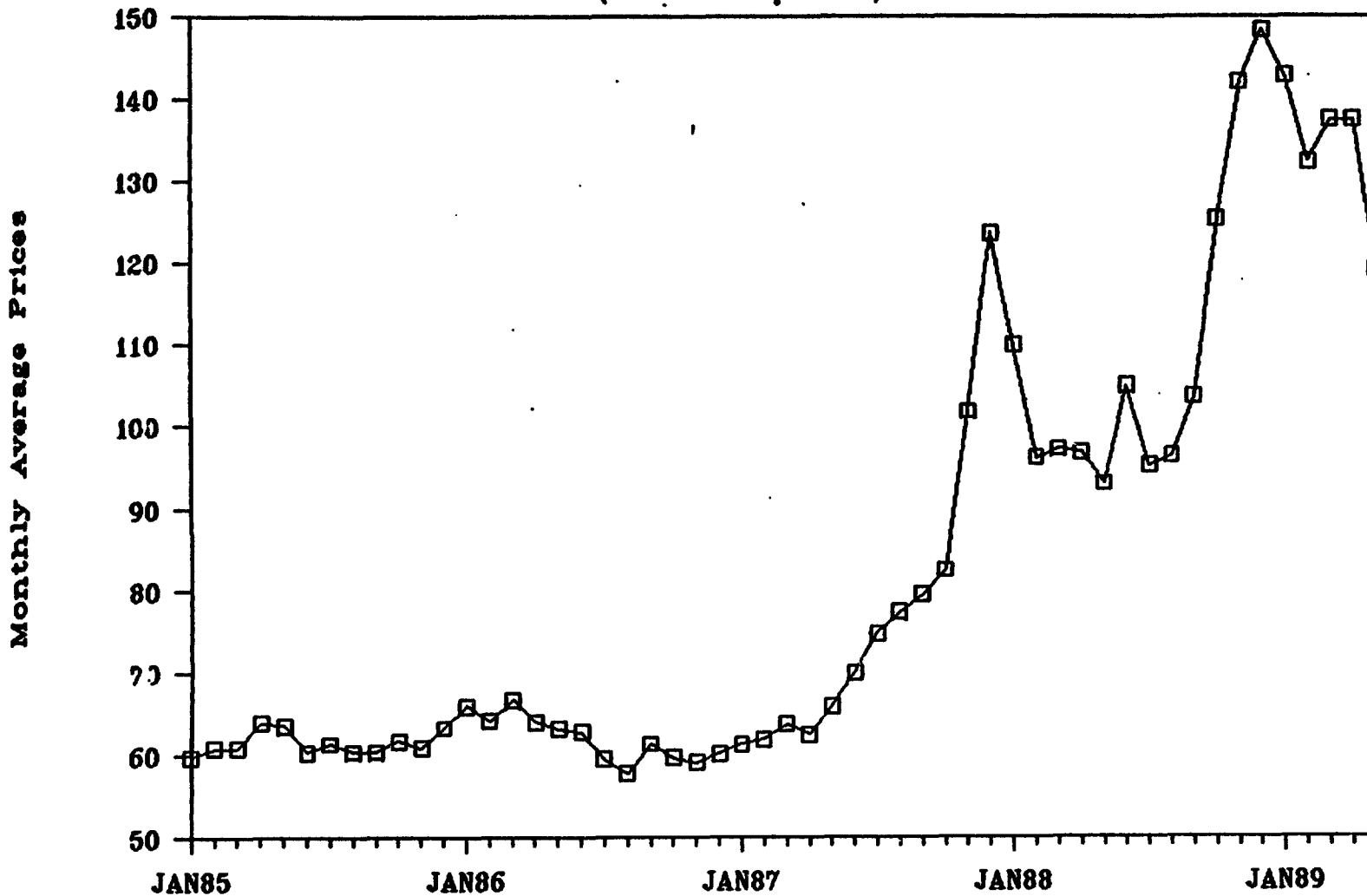


Figure 20

Gold Price Movements

(U.S. dollars per troy oz.)

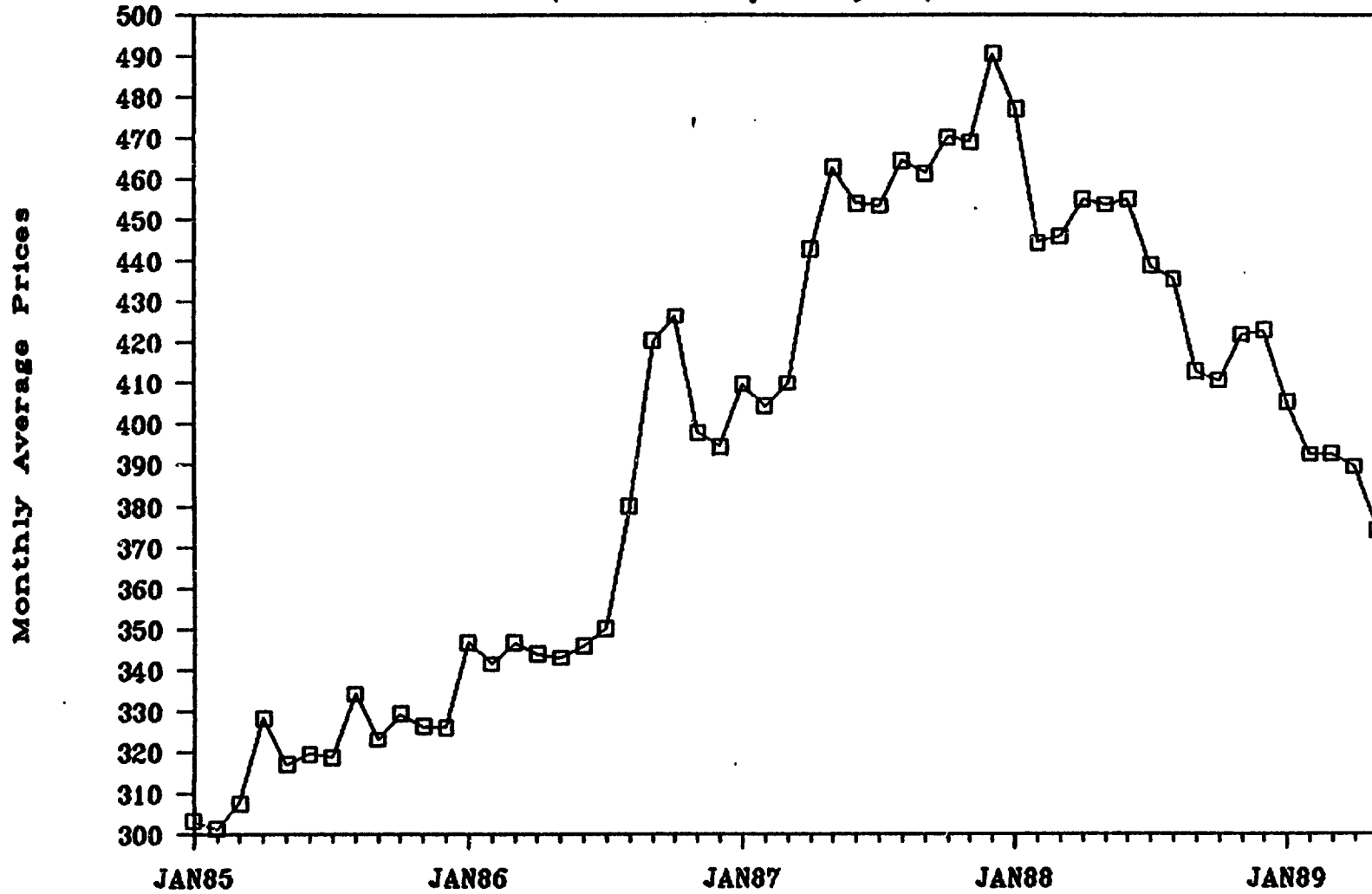


Figure 21

Palladium Price Movements

(U.S. dollars per troy oz.)

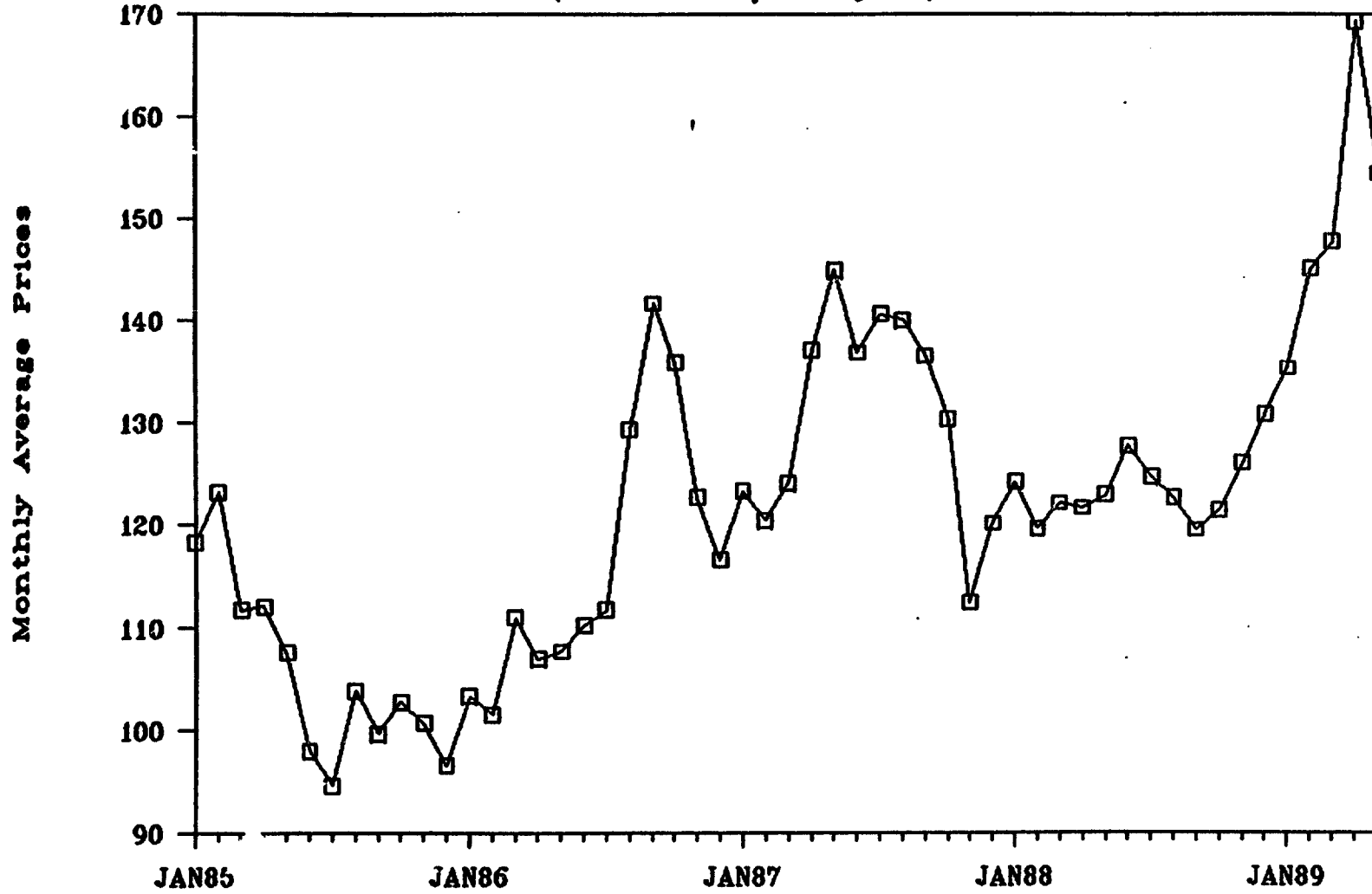


Figure 22

Platinum Price Movements

(U.S. dollars per troy oz.)

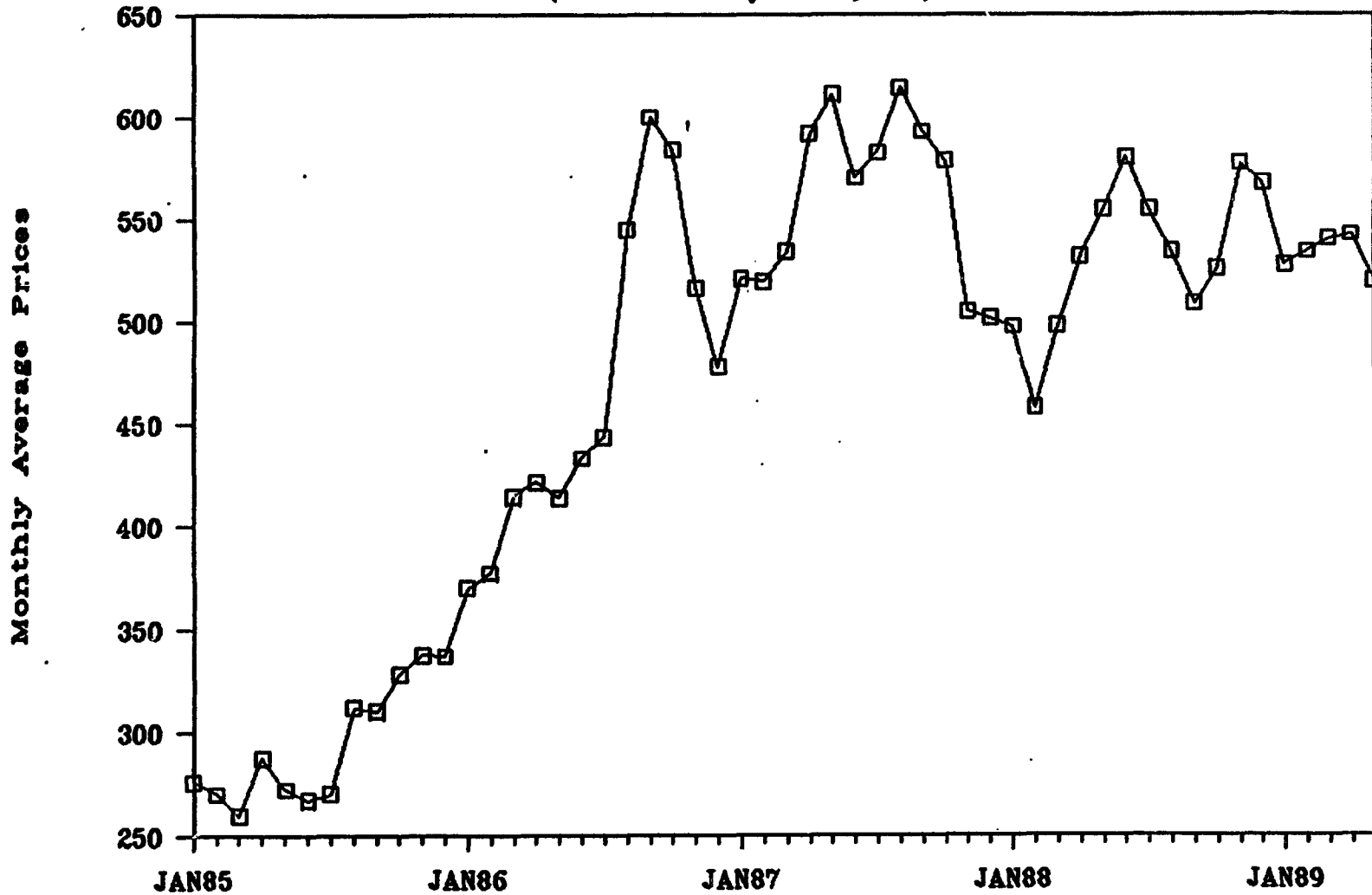
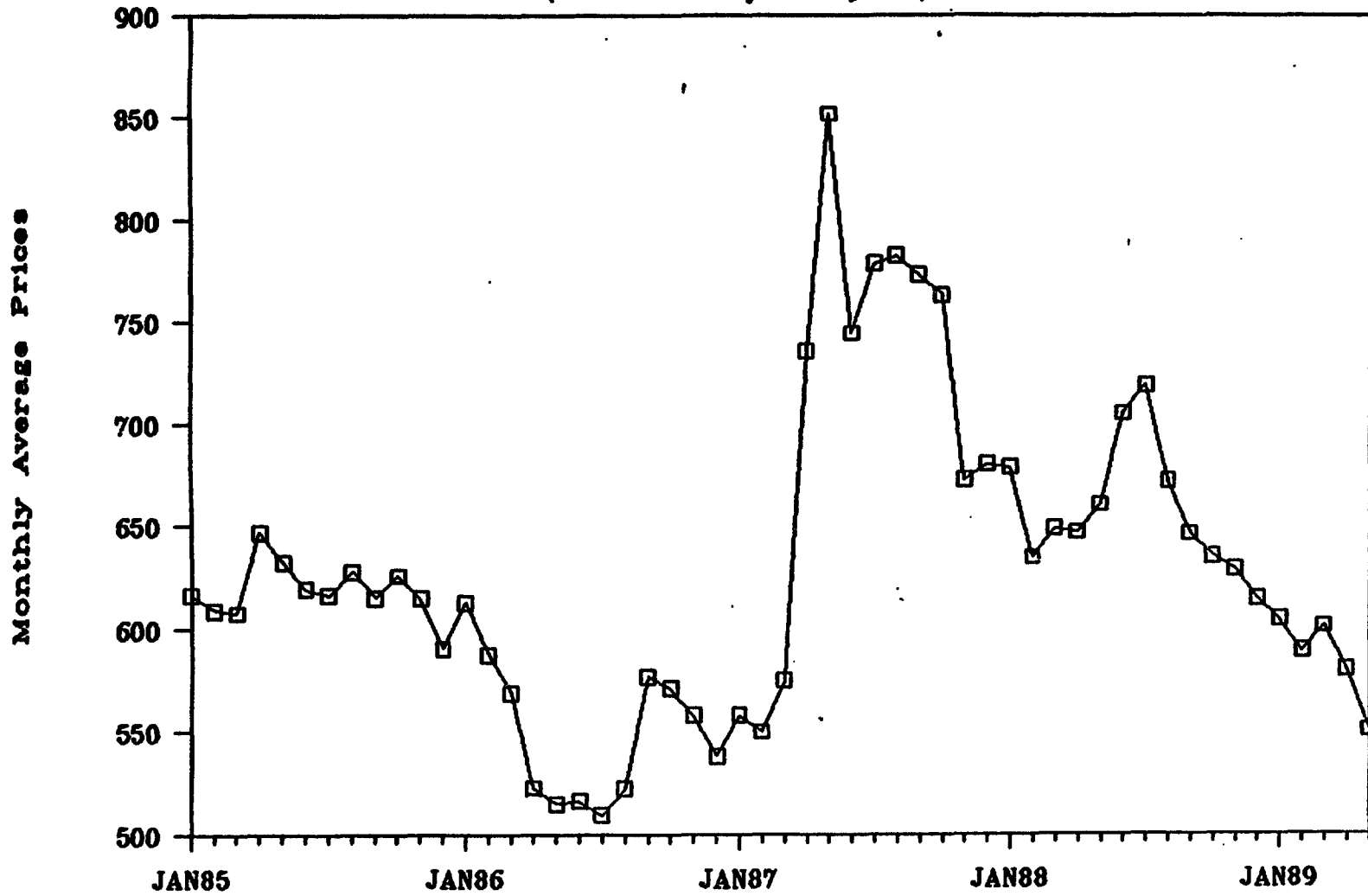


Figure 23

Silver Price Movements

(U.S. dollars per troy oz.)



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