Review

June/July 1983
Vol. 65, No. 6

Federal Reserve Bank of St. Louis

In This Issue . . .

The four articles in this *Review* address two important public policy issues. The first article focuses on the potential usefulness to farmers of the forthcoming agricultural options markets. The next three articles are concerned with various aspects of monetary policy actions.

In the first article, "Commodity Options: A New Risk Management Tool for Agricultural Markets," Michael T. Belongia discusses the mechanics of trading in the agricultural options markets, scheduled to begin next year as a supplemental phase of a Commodity Futures Trading Commission pilot program. He finds that options trading will provide new hedging and speculative opportunities for farmers who produce grain and businesses that purchase grain as an input. Belongia demonstrates how options could be used as part of a farmer's overall marketing strategy and how their use could affect income under various assumptions about market supplies and prices. The article concludes with a discussion of whether options markets would provide price insurance and liquidity to farmers more efficiently than current price support programs.

In the second article in this *Review*, "Two Measures of Reserves: Why Are They Different?" R. Alton Gilbert describes the two measures of banking system reserves published by Federal Reserve sources, and analyzes why their growth rates often differ substantially over periods of a few months.

He shows that differences between growth rates of the reserves series published by the Federal Reserve Bank of St. Louis and by the Board of Governors often reflect simply the different methods used in adjusting the reserve series for seasonal influences. At times, however, differences in methods of adjusting for the effects of changes in reserve requirements and differences in the treatment of vault cash as reserves have contributed to the short-run differences in growth rates observed in the past.

The Board of Governors revised its measure of reserves in May 1983, when it adopted new procedures for adjusting for seasonal influences. Although this revision did not reduce the average difference between monthly growth rates of the two measures of reserves, it will change the seasonal pattern that had previously existed between growth rates of the two series.

In the third article of this issue, Daniel L. Thornton reviews the policy actions of the Federal Open Market Committee (FOMC) during 1982. Because of the uncertainties about the relative behavior of M1 and M2 during the year due to technical factors, financial innovations and deregulation, and because of the significant decline in the velocity of M1, the FOMC shifted the relative weights given to M1 and M2 for short-run policy purposes. Eventually, it suspended the use of M1 as an intermediate policy target. Thornton shows that, despite these uncertainties, both M1 and M2 were close to the FOMC's desired short-run target paths.

In This Issue . . .

In the fourth article in this issue, "M1 or M2: Which Is the Better Monetary Target?" Dallas S. Batten and Daniel L. Thornton assess the extent to which financial innovation and deregulation of the past few years have affected the relative importance of M1 and M2 as intermediate targets of monetary policy. They investigate the relationship between each monetary aggregate and economic activity over the period that includes the latest two innovations — the introduction of money market deposit accounts (MMDAs) and super-NOW accounts. They find that, while the relationship between M1 and nominal GNP is stronger, in general, than that of M2 and nominal GNP, recent events have had greater confounding effects on the M1-GNP relationship. While this result should motivate continued scrutiny of the relative merits of M1 and M2, it provides no rationale, at present, to conclude that M1 be de-emphasized as an intermediate target of monetary policy.

Commodity Options: A New Risk Management Tool for Agricultural Markets

MICHAEL T. BELONGIA

THE trading of options on agricultural commodities has been banned in the United States since 1936. In a preliminary step to lift this ban, Congress included a provision in the Futures Trading Act of 1982 that authorized the Commodity Futures Trading Commission (CFTC) to establish pilot programs in the trading of agricultural options. Although actual trading of options on domestically produced agricultural commodities has not yet taken place, the CFTC expects its pilot program to include one option contract at each of the major exchanges.[1] The pilot programs for agricultural commodities are expected to begin sometime in late 1984 and continue for three years, at which time they will be evaluated.

For many people, the role of options in an overall risk-management strategy is unclear. In fact, because options trading has been banned for many years, the distinguishing characteristics of options are not widely known outside the commodities profession. This article attempts to clarify some of these issues by explaining the basic features of options and drawing distinctions between options and futures. The discussion also includes some simple examples of how options can function as a risk-management tool. Finally, because options contracts contain some — but not all — of the features of agricultural price support programs, the relationship between options markets and price supports is discussed.

FORWARD CONTRACTS AND FUTURES CONTRACTS

To define the unique characteristics of a commodity option, it might be useful first to discuss two related concepts: forward contracts and futures contracts.[2] A forward contract typically takes the form of an agreement between a commodity producer and an intermediary agent like the operator of a grain elevator. The contract typically defines an agreement in which a producer agrees to deliver to an elevator owner a specified quantity of grain at a stated date for a set price; the elevator owner agrees to accept delivery of the grain and to pay the set price.

A futures contract is a binding legal agreement between parties to sell or purchase a specified quantity of a standardized commodity at a stated date in the future for a set price. For example, corn contracts at the Chicago Board of Trade are written in 5,000 bushel lots of No. 2 yellow corn and carry stated delivery dates of

---

[1]Options on sugar are traded currently at the New York Coffee, Sugar and Cocoa Exchange as part of the pilot program's first stage; the options apply, however, only to sugar produced outside of the United States. Options on gold, Treasury bond and stock index futures also are being traded as experimental contracts in the pilot program.

[2]General references on the role of hedging include Holbrook Working, "Hedging Reconsidered," *Journal of Farm Economics* (November 1953), pp. 544–61; Ronald I. McKinnon, "Futures Markets, Buffer Stocks and Income Stability for Primary Producers," *Journal of Political Economy* (December 1967), pp. 844–61; and Anne E. Peck, "Hedging and Income Stability: Concepts, Implications, and an Example," *American Journal of Agricultural Economics* (August 1975), pp. 410–19.

A general overview of trading in commodity options can be found in Avner Wolf, "Fundamentals of Commodity Options on Futures," *Journal of Futures Markets* (Winter 1982), pp. 391–408; Bruce L. Gardner, "Commodity Options for Agriculture," *American Journal of Agricultural Economics* (December 1977), pp. 986–92; and William J. Baumol, "Commodity Options: On Their Contribution to The Economy," mimeographed (Princeton, N.J.: Mathematica, Inc., September 1973).

up to 16 months forward.[3] The set price at which the corn can be bought or sold is determined daily in the market where this particular futures contract is traded.

These definitions indicate at least two respects in which forward and future contracts differ. First, futures are standardized contracts traded in highly liquid and well-organized markets. In contrast, forward contracts are individual agreements between two parties; their unique, case-by-case nature effectively prevents their trading and, consequently, makes them very illiquid. The two contracts also differ in their handling of prices at which exchange will occur. Specifically, the price at which grain will change hands in the forward contract is fixed for the duration of the contract. The price of a futures contract, on the other hand, changes daily as new supply and demand information affects agents' expectations of market prices at the time the futures contract expires. Because forward contracts are not traded in organized markets, they are excluded from the remainder of the discussion.[4]

The price of a corn futures contract depends on expectations of future spot corn prices, and, because these expectations change from day to day, so, too, do contract prices. If a trader believes that corn prices will be above the overall price expected by the market (the average contract price) in the future, he will buy a corn contract for future delivery of 5,000 bushels; this is a "long" position, which will generate an economic profit if the price of corn rises above the contract price. Conversely, an agent who wants to insure against a decline in the expected future price of corn will sell a futures contract agreeing to deliver corn at some future date; this is a "short" position. If the agent is an agricultural producer who holds an inventory of corn, this strategy will provide a hedge against price declines.

We can see, then, why futures markets might exist.[5] Producers (hedgers) who wish to avoid risk sell a futures contract; although they forfeit the chance to in-

crease profits if prices increase, they are guaranteed a known return. Other agents (speculators) bear this price risk in return for the chance to profit if prices rise above expectations. As we will see, options function in a similar manner, except for one distinguishing feature of futures contracts: the only way to escape the obligation of the futures contract is to sell it to another party.

WHAT IS AN OPTION?

In contrast, an option conveys the right, *but not the obligation,* to buy or sell a given amount of a commodity at a fixed price until some specified date when the option expires. Unlike a futures contract, which *requires* the purchase or sale of a commodity, the holder of an option may elect to let the option expire without exercising its rights. In this sense, an option is more like a form of price insurance in which one person pays a premium to insure against the possibility of a particular event occurring. If that event — specifically, a large change in price — does not occur, the person who purchased the option loses only the premium he paid for the price insurance. In comparison, losses on short futures positions, essentially, are unlimited; losses on long futures positions are limited to the price of the contract.

The two basic types of options are the "put" and the "call." A call option gives the purchaser of that option the right to purchase a given quantity of a commodity at a stated price on or before the option's expiration date. Conversely, a put option gives the option purchaser the right to sell a given quantity of a commodity at a stated price on or before the expiration date; again, with respect to the CFTC pilot program, options will convey the right to buy or sell a particular futures contract.[6]

---

[3]Corn contracts are dated for March, May, July, September and December delivery. Contracts typically expire during the second to last week of the stated delivery month.

[4]This is *not* to say that forward-contracting is unimportant. Instead, unlike futures and options, forward contracts are individual legal agreements not traded in organized markets.

[5]The question of why futures markets exist does not have a definitive answer. Some economists have argued that these markets perform an insurance function while others find value in the amount of information on prices and price expectations that futures markets produce; see, for example, Fischer Black, "The Pricing of Commodity Contracts," *Journal of Financial Economics* (January/March 1976), pp. 167–79.

Some economists, however, have questioned the validity of the insurance argument; see, for example, Lester G. Telser "Why There Are Organized Futures Markets," *Journal of Law and Eco-*

nomics (April 1981), pp. 1–23. In particular, Telser contends that a foward contract can provide all of the price insurance offered by a futures contract. Instead, he argues, futures markets exist to meet the demand for a "fungible financial instrument traded in a liquid market" (p. 8). Or, rather, even though forward contracts and futures both provide price insurance, the illiquidity of forward contracts creates a demand for a more liquid instrument that holds the attributes of money (or near money). Futures contracts exist, Telser argues, to meet this demand for liquidity, not the demand for price insurance.

Finally, some observers have argued that trading in futures is little more than gambling.

[6]The management and surveillance of the pilot program have been simplified by permitting options to apply only to trades of futures contracts. That is, unlike an option to purchase a physical product — a trade that would require agreements on the quality of the product, place of delivery and other contract features — the pilot program will permit only the trading of options on the standardized futures contracts of specific commodities.

Table 1

Sample Listing of Options on Sugar Futures

COFFEE, SUGAR & COCOA EXCHANGE Sugar Option Prices 5/31/83 ¢/lb.

	Strike Prices	Settlement Calls	Puts		Strike Prices	Settlement Calls	Puts
July 83	6.50	6.90	0.01	Oct 83	7.00	6.50	0.01
13.36	7.00	6.40	0.01	13.50	7.50	6.00	....
	7.50	5.90	0.01		8.00	5.50	0.01
	8.00	5.40	0.01		8.50	5.00	0.02
	8.50	4.90	0.01		9.00	4.50	....
	9.00	4.40	0.01		9.50	4.00	0.20
	9.50	3.90	0.04		10.00	3.50	0.30
	10.00	3.32	0.08		10.50	3.00	....
	10.50	2.85	0.30		11.00	2.65	0.35
	11.00	2.40	0.49		11.50	2.20	0.45
	11.50	2.00	0.54		12.00	1.90	0.55
	12.00	1.60	0.65		12.50	1.75	0.75
	12.50	1.20	0.75		13.00	1.60	1.10
	13.00	0.85	0.80		13.50	1.45	1.60
	....	....	....		14.00	1.25	....
Mar 84	7.00	7.50	0.01	July 84	7.00	....	0.01
14.48	8.00	6.50	0.10	14.95	8.00	6.95	0.03
	9.00	5.50	0.15		9.00	5.95	0.10
	10.00	4.50	0.21		10.00	4.95	0.27
	11.00	3.50	0.40		11.00	3.95	0.45
	12.00	2.50	0.50		12.00	2.95	0.68
	13.00	1.95	0.65		13.00	2.15	0.90
	14.00	1.65	1.00		14.00	1.80	1.10
	15.00	1.35	1.35		15.00	1.45	1.50
	....	....	....		16.00	1.20	2.00

Vol. 5/27/83 37 Open Int. 5/27/83 calls 1,711 puts 171
Each .01 premium = $11.20 e.g., .50 = $560.

Farmers who wish to use options as a hedge against declining cash prices would buy a put option in combination with positions in the forward, futures or cash markets. Food processors or other businessmen that sought a hedge against price increases in the raw commodities they purchase would buy a call option to complement their positions in other markets. An agent who has a position only in the option market is a speculator. Speculators fulfill a desirable market function by assuming risk that other economic agents do not wish to bear.

Each option contract has several characteristics specified as part of the legal document itself. These include the futures contract to be traded, the price at which the option purchaser may buy or sell the futures contract (called the strike or exercise price) and the expiration date for the option. Another important feature of options — the option premium — is determined by supply and demand conditions in the option market.

The relationships among these different option terms are shown in table 1, which is a reprint of one daily summary of the sugar options traded on The New York Coffee, Sugar and Cocoa Exchange. The summary, dated May 31, 1983, applies to options on sugar futures that expire in July 1983, October 1983, March 1984 and July 1984. Considering only the option on July 1983 futures, the summary indicates that strike prices cover a range from 6.5 to 13 cents per pound of sugar; that is, a variety of option contracts are available and each option permits the buyer to sell or purchase sugar futures at a stated price somewhere between 6.5 and 13 cents per pound. The number immediately below the contract date (July 83) is the current price of July sugar futures — 13.36 cents per pound.

The second and third columns, both under the heading "Settlement," are the premiums that apply to the different put and call options contracts. Recall that, while the strike prices of different options are a part of those legal contracts, the settlement premiums on call

and put options are determined by price expectations in the option market. Generally, premiums are related to three factors: the strike price of the individual option, the length of time until the option expires and the price variability of the underlying futures contract.

To take a specific example from these data, the premium on a call option to purchase July 1983 sugar futures at 10 cents per pound is 3.32 cents per pound; the total cost of guaranteeing the possibility to purchase July sugar futures at 10 cents per pound is 13.32 cents per pound (10 + 3.32), compared with 13.36 cents per pound futures price. Absent from these calculations are the transaction costs (brokerage fees) of buying an option or a futures contract.

DETERMINANTS OF OPTION PREMIUMS

Option premiums are related directly to an option's intrinsic value and its time value.[7] Intrinsic value is the difference between an option's strike price and the current futures price. For example, if a call option's strike price — the amount at which a corn futures contract could be purchased — were $2.50 per bushel and the current futures price were $2.70 per bushel, this option would have an intrinsic value of $0.20 per bushel. Intuitively, intrinsic value exists if a profit can be made by exercising the rights of the option. If, in the example above, the current futures price were $2.30, a call option with a $2.50 per bushel strike price would be "out of the money": that is, a loss would be incurred if the option rights were exercised. Typically, howev-

er, an option's premium will exceed the implied amount of its intrinsic value.

One reason premiums will exceed intrinsic value is a second source of value in an option contract: time value. Because the future is uncertain, there is always the possibility that unexpected events will significantly affect prices. And, because this possibility exists, some market participants will be willing to buy or sell an option on the chance that one such event will occur. This explains, for example, why an "out of the money" option still will be traded at a positive premium; that is, some buyers are willing to take the chance that some event will change futures prices enough to make this a profitable option. Similarly, premiums may be greater than intrinsic value because buyers are willing to pay for the chance that further changes in the futures price may make a profitable option even more profitable before it expires.
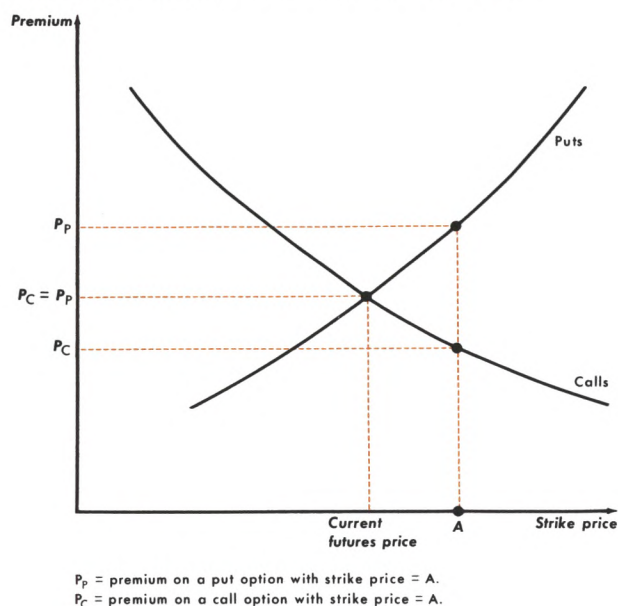
An option's expiration date is the key factor in determining its time value. As the length of time until expiration decreases, there is less time for the futures price — and, therefore, the option's profitability — to change markedly. Conversely, an option of long duration has more time value, ceteris paribus, because the probability of an unexpected event changing its profitability is greater.

The concepts of intrinsic value and time value are illustrated by the data shown in table 1. For example, the call option on March 1984 futures with a 14 cents per pound strike price has an intrinsic value of 0.48 cents per pound (14.48 − 14.00 = 0.48), which is lower than its premium of 1.65 cents per pound. The 1.17 cent difference between the premium and intrinsic value reflects this option's time value and other factors that tend to increase premiums. Other things being equal, this 1.17 cent difference should decline as the length of time until March decreases and the time value of the option diminishes.

Time value also is shown in the premiums associated with options that apply to futures contracts dated for later delivery. Compare, for example, the four call options with 11 cents per pound strike prices that apply to each of the four listed futures. In this instance — and in others — premiums for options on July 1984 sugar futures are the highest premiums for any of the listed contracts. This occurs because the greater length of time until the option expires increases the probability that some unanticipated event will cause significant changes in futures prices. And, with greater price uncertainty, agents in this market will be willing to pay more for price insurance.

---

[7]Option premiums also are influenced by the volatility of futures prices and interest rates. As futures prices become more volatile, the uncertainty associated with any one contract's profitability also increases. This greater uncertainty tends to increase the value of price insurance and, therefore, the value of option premiums. Conversely, high levels of interest rates tend to have negative effects on option values. That is, as the returns on alternative, interest-bearing investments increase, the opportunity cost of holding an option position increases. This "competition" among alternative investments will tend to decrease option premiums. For a technical discussion of how option premiums are determined, see Fischer Black and Myron Scholes, "The Valuation of Option Contracts and a Test of Market Efficiency," *Journal of Finance* (May 1972), pp. 399–418; Black and Scholes, "The Pricing of Options and Corporate Liabilities," *Journal of Political Economy* (May–June 1973), pp. 637–54; Robert C. Merton, "The Theory of Rational Option Pricing," *Bell Journal of Economics and Management Science* (Spring 1973), pp. 141–83; Clifford W. Smith, "Option Pricing: A Review," *Journal of Financial Economics* (January/March 1976), pp. 3–51; James MacBeth and Larry L. Melville, "An Empirical Examination of the Black-Scholes Call Option Pricing Model," *Journal of Finance* (December 1979), pp. 1173–86; and Thomas J. O'Brien and William F. Kennedy, "Simultaneous Option and Stock Prices: Another Look at The Black-Scholes Model," *The Financial Review* (November 1982), pp. 219–27.

Figure 1
Relationship Between Premiums on Put and Call Options

P_P = premium on a put option with strike price = A.
P_C = premium on a call option with strike price = A.

These relationships are illustrated further in figure 1. Strike prices are plotted on the horizontal axis and option premiums are plotted on the vertical axis. The two interior lines labelled "Puts" and "Calls" plot the relationships between strike prices and premiums for the two different kinds of options. In one sense, this figure is a stylized plot of the strike price and premium data contained in table 1.

As the foregoing discussion suggests, strike prices and premiums for put options should be related positively. That is, the right to sell a product at a low price should have a relatively low value. Conversely, as the strike price at which the product can be sold rises, the right to execute this sale also should increase in value. These relationships are the basis for giving the "Put" line a positive slope.

The strike price-premium tradeoff for call options is just opposite that of puts and, consequently, its line has a negative slope. Intuitively, this is supported by the notion that the right to buy a product at a low price should have a higher value than the right to buy at a high price. Therefore, as a call option's strike price declines, its premium should increase.

The intersection of the "Put" and "Call" lines also suggests a relationship not revealed in the discontinuous data of table 1. Specifically, when an option's strike price is equal to the current futures price, the premium on a put should equal the premium on a call. The reasoning is that, if the futures price represents the market's best guess about actual prices at a later date, the value of the right to buy at that price (a call) should be equal to the value of the right to sell at that price (a put). Or, from a different view, options with strike prices above or below the current futures price carry an implicit bet that the current futures price is "wrong." So, for example, a call option with a strike price at point A would have a relatively low premium, because it would give the right to buy a product in the future at a price higher than the market's current best guess of that future price. Conversely, a put option with that same strike price would have a relatively high premium to reflect the bet that the current futures price underestimates the level of cash prices at the later date.

MARKETING STRATEGIES AND THE ROLE OF OPTIONS

The mechanics and terminology of options trading may be defined further by way of an example. Consider the case of a farmer who, at time of spring planting, expects to produce 5,000 bushels of corn, an amount that coincides with the size of one futures contract. He also thinks that his total cost of producing each bushel of corn will be $2.50. Finally, he knows that the futures contract dated for December delivery — after his harvest time — values corn at $2.80 per bushel. Assuming a constant 10-cents-per-bushel basis, he can expect local cash prices at the time of harvest to be $2.70 per bushel.[8]

These prices and the effective support prices of government crop programs represent the core of information on which his marketing decisions must be made. Still unknown, however, are the quality of the growing season weather and the effects it and other factors may have on his yield per acre. Or, rather, because he still is unsure of his yields and those of other producers, it is unclear whether cash prices at harvest will be higher or lower than $2.70.

---

[8]Basis is the per unit difference in the futures price and the local spot (cash) price for a commodity. In this example, the current (May) price of a December futures is $2.80; the current spot price is $2.70. Therefore, the basis is $0.10. The returns to a person with a position in the futures market is the change in the basis that occurs. That is, if December futures increase to $3.00, the basis becomes $0.30 ($3.00 − $2.70) which produces a $0.20 ($0.30 − $0.10) change in the basis. This 20-cent change will be a gain or loss depending upon whether a person held a long or short position in futures. Typically, the basis reflects the spread between local spot markets and the relevant futures market. Costs of financing, storage and insurance also are part of the basis. Also, contrary to the simplifying assumption of this example, the basis will not be constant during the crop year.

Table 2

Results of Alternative Marketing Strategies Under a Price *Increase*

Assumptions: On May 1, prior to planting, a corn producer anticipates a 5,000 bushel harvest with costs of $2.50 per bushel. Also in May, the December futures contract prices corn at $2.80 per bushel. In November, the realized cash price is $3.10 per bushel and the December futures price is $3.20.

IN MAY:	STRATEGY		
	#1: No hedge	#2: Sell Futures Contract	#3: Buy "Put" Option
	Plant corn and do nothing	Plant corn and sell one December corn future at $2.80 per bushel	Plant corn and buy one "put" option (right to sell) on December corn futures with an exercise price of $2.80 and a 15¢ per bushel premium
IN NOVEMBER:	Sell corn at $3.10 cash price	Sell corn and buy December futures at $3.20	Sell corn and let option expire
Income	$ 15,500	$ 15,500	$ 15,500
Cost	−12,500	−12,500	−12,500
Loss on Futures	.....	− 2,000[1]	.....
Option Premium	.....	.....	− 750
PROFIT	$ 3,000	$ 1,000	$ 2,250

[1]The increase in the price of December futures from $2.80 to $3.20 implies a $0.40 per bushel loss to the person who sold December futures in May.

Depending on his own attitude toward risk, an individual producer may choose several marketing strategies. On one extreme, he may go totally unhedged — that is, he may just harvest his crop and accept whatever cash price prevails at that time. At the other extreme, a very risk-averse producer may hedge his entire crop by selling one corn futures contract. By hedging, the producer can guarantee that the price he receives for his corn will be $2.80 per bushel, the current price of December corn futures. Between these extremes is a strategy in which a portion of the crop is hedged in the futures market and the remainder is sold at the prevailing cash price.

These strategies, however, also indicate that there is a gap in alternatives that would be filled by a market in commodity options. That is, a producer who is totally unhedged has no insurance against downside price movements. Or, following this example, a producer who does not hedge at least part of his crop in the futures market might face a cash price of something like $2.00 at time of harvest if the national crop is larger than previously expected; this would produce a loss of $0.50 per bushel. Conversely, a producer who hedged all 5,000 bushels at $2.80 has no alternative but to accept that price at harvest. While this form of price insurance guarantees $2.80 per bushel, it also precludes the chance to sell for the higher cash prices that could prevail if the national crop were smaller than expected. Instead of these marketing positions, a more flexible approach would have two characteristics: it would provide insurance against a decline in cash prices, while simultaneously allowing gains to be made if cash prices increased above contract prices. Commodity options have these features.[9]

---

[9]Options have the advantage that if a farmer's hedge became uncovered due to, say, a crop failure, his losses would be limited to the option premium. Losses from a futures hedge under these conditions could be much larger if prices increased substantially.

Continuing with the earlier example, it is clear that a market in commodity options would expand the scope of marketing strategies for farmers and agribusiness. In addition to the earlier marketing strategies — no hedging versus complete hedging — a third strategy involving an option is introduced. Under the assumptions in this example, production costs of $12,500 will be incurred under any marketing strategy (5,000 bushels × $2.50 per bushel). Also assumed is a $750 (15 cents-per-bushel premium) cost for buying a "put" option.

Table 2 shows the results of these strategies under an assumed increase in futures prices to $3.20 per bushel; assuming a constant 10-cents basis throughout this example, cash prices at harvest would be $3.10 per bushel.[10] Each strategy is detailed in a separate column of the table. Each strategy also involves two distinct steps: first, the choice of a marketing strategy at time of planting (May) and, second, the execution of that strategy after harvest (November). These stages are represented in the upper and lower halves of the table.[11]

Under assumed increases in futures prices to $3.20 and in cash prices to $3.10 per bushel, strategy No. 1 yields a return of $3,000, the highest of the three strategies. Because income and production costs are equal in each strategy, the "no hedge" earns greater returns because it avoids a loss of futures (strategy No. 2) and the cost of option premiums (strategy No. 3). Therefore, a producer choosing strategy No. 1 earned a greater profit during this year but did so without insurance against price declines. Conversely, producers choosing to hedge their crops or purchase options realized smaller profits, but were protected against the possibility of price decreases. The return to strategy No. 2 is lower by the $2,000 loss on the sale of December futures [($3.20 − $2.80) × 5,000 bu. = $2,000]. Producers choosing to buy options instead of futures earned greater profits, but this result is dependent on the assumed values for alternative options premiums

and changes in futures prices; these results merely illustrate qualitative differences among marketing strategies.

Returns under different risk-management strategies might be illustrated more clearly by re-evaluating the previous example under a decline in the futures price. Table 3, which includes balance sheet figures for an assumed November futures price of $2.40 and cash price of $2.30 (constant 10-cents-basis assumption), reports these results. As in the previous example, the strategy involving options (No. 3) yields a return between those of the other strategies. Now, however, after a price decline, the unhedged strategy (No. 1) yields a loss of $1,000; or, rather, column one shows what can occur if market prices decline and a producer has no protection against such losses. Conversely, column two — under a strategy of complete hedging — shows the benefits of locking in a known price at the time of planting. Finally, the strategy that includes options shows a profit, but one less than that for selling futures; the difference is the amount of the option premium. But, although the premium costs are $750, the purchase of the corn futures yields a return of $2,000.

Finally, table 4 illustrates the relative returns to the three strategies if prices do not show a net change during the year. As the entries in the table indicate, each strategy would result in a sale of corn in the cash market at $2.70 per bushel. Once again ignoring the transaction costs of futures or options contracts, strategies No. 1 and No. 2 would yield a profit of $1,000, whereas the cost of the option premium would reduce returns to strategy No. 3 to $250.

In view of these differing returns to different strategies as assumptions vary concerning end-of-season prices, an important consideration is the expected *(ex ante)* return to each marketing strategy. That is, in May, what can an individual producer expect to earn from crop marketings in November? A comparison of these expected values is shown in table 5.

As the table indicates — for this set of alternative outcomes and probabilities — strategies No. 1 and No. 2 yield equal expected returns, while the strategy using options produces a lower expected return. This is not unlikely, however, in view of the speculative services that options offer in addition to their basic price insurance.[12] Or, rather, because options offer a chance

---

[10]Each of these examples ignores a number of factors that would complicate the analysis. For example, the output of this individual producer does not vary with changes in aggregate production. The returns also are dependent on assumptions regarding the elasticity of demand. Rather than providing a complete analysis that considers these complicating considerations, however, the intent of the examples is to illustrate qualitative differences among the various strategies.

[11]The strategies shown are the most basic approaches to grain marketing. Much more complicated examples, which combine the simultaneous use of differing positions in futures and options markets, can be used to illustrate how varying levels of price insurance and speculation can be achieved. See, for instance, the strategies discussed in *Strategies for Buying and Writing Options on Treasury Bond Futures* published by the Chicago Board of Trade. These examples can be adapted with few changes to strategies for grain marketing.

[12]For example, see Telser, "Why There Are Organized Futures Markets," for a discussion and references concerning why agents may choose to engage in speculative strategies in which expected returns are negative.

Table 3

Results of Alternative Marketing Strategies Under a Price *Decrease*

IN MAY:	#1: No hedge	#2: Sell Futures Contract	#3: Buy "Put" Option
		STRATEGY	
		Same strategy as in table 2	
IN NOVEMBER:	Sell corn in cash market at $2.30 cash price	Sell corn in cash market at $2.30 and buy December futures at $2.40	Buy December futures for $2.40 and exercise option right to sell December futures for $2.80; sell harvested corn for $2.30 cash price
Income	$ 11,500	$ 11,500	$ 11,500[1]
Cost	−12,500	−12,500	−12,500
Futures Premium	......	2,000	2,000
Option Premium	......	......	− 750
PROFIT	$− 1,000	$ 1,000	$ 250

[1]Total income of $13,500 is derived from sales of harvested corn (5,000 bu. × $2.30 = $11,500) and profit of $2,000 on the change in futures prices [($2.80 − $2.40) × 5,000 bu. = $2,000].

Table 4

Results of Alternative Marketing Strategies Under Constant Prices

IN MAY:	#1: No hedge	#2: Sell Futures Contract	#3: Buy "Put" Option
		STRATEGY	
		Same strategy as in table 2	
IN NOVEMBER:	Sell corn at $2.70 cash price	Sell corn in cash market at $2.70	Let option expire and sell corn in cash market at $2.70
Income	$ 13,500	$ 13,500	$ 13,500
Cost	−12,500	−12,500	−12,500
Futures Gain (Loss)	......	......	......
Option Premium	......	......	− 750
PROFIT	$ 1,000	$ 1,000	$ 250

Table 5

Expected Returns From Alternative Marketing Strategies

	STRATEGY		
	#1: No hedge	#2: Selling Futures	#3: Buy "Put" Option
	$ 3,000	$ 1,000	$ 2,250
	− 1,000	1,000	250
	1,000	1,000	250
Total Returns	$ 3,000	$ 3,000	$ 2,750

Expected returns = TOTAL RETURNS × (0.33)[1]

	# 1	# 2	# 3
E(R) =	1,000	1,000	917

[1]For purposes of this example, it is assumed that the real-world conditions described in tables 2–4 all occur with equal probability of 1/3.

Figure 2
Returns Under Alternative Marketing Strategies

P*=Exercise (strike) price for a put option

for additional profits if prices rise to a level greater than the sum of the market price plus the option premium, it is expected that this additional speculative feature can be gained only at some additional cost.

These relationships might be seen more clearly in a graphic comparison of returns produced by the three marketing strategies discussed earlier. Figure 2 plots returns for unhedged (1), straight-hedge (2) and options (3) strategies.[13] The dashed line shows the returns to an unhedged strategy in which all grain is sold in the cash market at the prevailing price; as might be expected, it is a 45-degree line from the origin. Returns to a straight hedge, involving the sale of a futures contract, are shown by the horizontal line drawn at a level denoted by R_H. This line shows that the producer can guarantee a return of R_H per bushel but cannot gain from price increases above that level.

The kinked line shows the returns to a strategy involving options and, by inference, the role options play in hedging — speculative strategies. In fact, the shape of this returns line illustrates the unique features of a put option. The horizontal segment of the line, drawn at a level equal to $2, shows the maximum return that can be achieved if futures prices are below the option's exercise price. Or, rather, because the
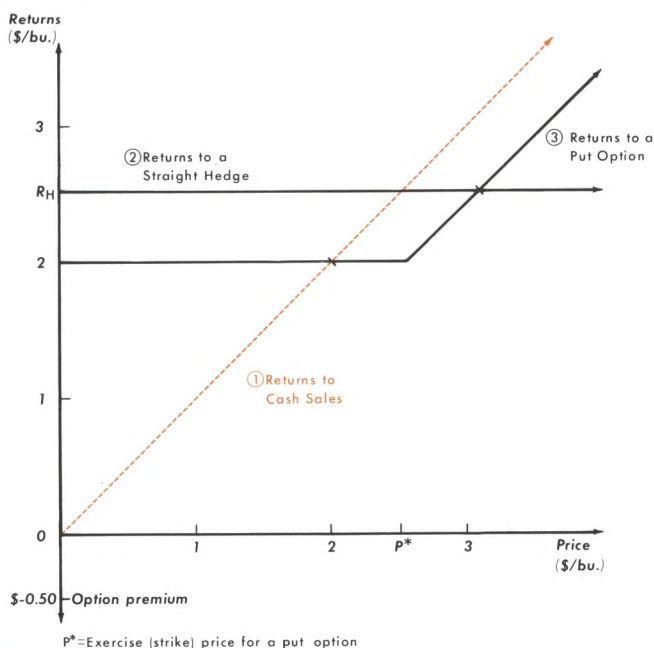
figure indicates that the option premium is $0.50, the $2 level of the net returns line implies that the option's strike price is $2.50 (strike price − premium = net return). This horizontal line segment also is the *minimum* return the owner of this put option will earn. The horizontal portion of the option's return line, then, represents the insurance characteristics of an option.

The returns line also has an upward-sloping segment that begins at the break-even price of $2.50; this segment illustrates the speculative characteristics of options. That is, for futures prices above $2.50, the option can be allowed to expire, and the grain can be sold in the cash market at higher prices. Notice, however, that this portion of the option's return line falls below the "returns to cash sales" line by an amount equal to the option premium. Conversely, at all prices above $3.00, the option yields a higher return than a straight hedge in the futures market.

Finally, it should be noted that figure 2 implies that a strategy involving options performs most poorly if prices remain within a $2.00–$3.00 band; both futures and cash market sales will produce a higher net return for prices in this range. And, because the current futures price in this example is $2.50, this result highlights again the unique feature of an option: it carries the implicit "bet" that the futures price underesti-

---

[13]This figure is adapted from a similar diagram in Gardner, "Commodity Options for Agriculture."

mates the eventual level of cash prices by a substantial margin. In fact, as this example is written, the purchaser of a call option on this futures contract would believe the futures price will increase by at least 20 percent (50 cents) to offset the option's 50-cent premium.

The general result implied by these examples is that commodity options provide insurance against price declines without totally eliminating the potential profits from price increases. Although total returns to a strategy involving options tend to be lower than returns to other strategies (for example, strategy No. 1 in table 2 and strategy No. 2 in table 3) because the additional costs of option premiums are incurred, options never produce a loss (in these examples) and yield substantially higher returns than futures if prices increase. Therefore, somewhat lower average returns provided by a strategy involving options might be viewed as the price paid for additional speculative services not available in futures markets.

OPTIONS MARKETS VS. PRICE SUPPORTS

A market in commodity options would offer grain producers many of the hedging opportunities currently available in legislated price support programs.[14] For example, a put option's strike price would function in much the same manner as program loan rates. And, as with an option position, a producer is not required to comply with program provisions but may elect to exercise program privileges at his discretion. At a general level, options and price support programs function in similar fashion. And, in one sense, a function of the CFTC pilot program may be to discover whether options markets can co-exist with price support programs as they now stand.

There are at least two important differences, however, between options and current price support programs. First, unlike one specified loan rate that applies for an entire crop year, an option purchaser may select from a variety of contracts with different strike prices and premiums. Second, trading in options contracts will not have the large and direct effects on agricultural production and resource allocation that have been attributed to price supports. The particulars of each distinction are discussed below.

If a grain producer is eligible to participate in a price support program, one of his key decision variables is

the program's loan rate. If market prices fall below the loan rate, which is a legislatively determined price per bushel of grain, the producer can place his grain in Commodity Credit Corporation (CCC) stocks and receive a loan in exchange; the loan value is determined by multiplying the number of bushels placed in CCC stocks by the loan rate. If, after nine months, market prices have not risen above the loan rate, the producer may elect to forfeit his grain to the CCC and keep the loan. In this way, the loan rate serves as an effective price floor for eligible producers. Also notice that, although these producers are hedged against price declines, they are free to sell their grain at market prices if such prices rise above the loan rate.

This protection against large price declines, while maintaining the possibility of profits, also is a distinguishing feature of a commodity option. Options, however, differ from government price supports by offering a range of strike prices (essentially, different loan rates) from which a producer can choose. In other words, options allow producers to select the level of prices at which they wish to be hedged against further price declines.

This point can be clarified by an example. Consider, for instance, the 1983 corn program and its loan rate of $2.65 per bushel. While it provides this price floor for producers, price insurance against declines below, say, $2.90, is available only by selling a futures contract at that price. Recall, however, that one disadvantage of this strategy is the rigidity of obligations implied by a futures contract.

In contrast to these less flexible strategies, a viable options market would allow producers to select the level of price insurance they desire. For example, as a parallel to the data in table 1, an option on corn futures might list strike prices ranging from $2.30 to $3.20 per bushel; each option also would have its own premium. Therefore, a producer who wanted protection against price declines below $3.20 could buy a put option with that strike price. Similarly, if $2.30 were an acceptable price floor, that put option could be purchased. The unique feature of options, however, is that individuals are free to select the amount of price insurance they desire and pay a competitively determined premium for it.

The other main distinction between options and price supports is that options are not likely to have large direct effects on the quantity of grain produced.[15] Economic theory suggests that effective support pro-

---

[14]For a discussion of these programs, see Michael T. Belongia, "Outlook for Agriculture in 1983," this *Review* (February 1983), pp. 14–24; or Bruce L. Gardner, *The Governing of Agriculture*, (The Regents Press of Kansas, Lawrence, Kansas, 1981).

[15]See Gardner, "Commodity Options for Agriculture."

grams will increase production by increasing producers' expected prices and decreasing the variance of their returns.[16] Under these conditions, producers can expect to receive greater returns at less risk. If program incentives to increase production are not offset by output reductions effected by program acreage limitations, price supports will allocate too many resources to the production of the protected commodities. These distortions in resource allocation could be avoided if they were replaced by options trading.

But even if direct effects on output were minimized, options will not avoid all resource allocation effects associated with government price support programs. For instance, this approach to risk management may induce some producers to shift from the use of fertilizer and pesticides to the purchase of options. Similarly, agents who write options will likely shift some resources from other investments to the purchase of futures or physical commodities in an effort to offset their options positions. Therefore, to the extent options become an attractive asset to marketing strategies, this new market will have some effects on resource allocations.

What options would avoid are the wealth transfers and capitalization effects associated with the "free" price insurance of government programs.[17] That is, current government programs transfer wealth from taxpayers who pay for the price insurance to producers who receive the benefits of its protection. Wealth also is transferred from land buyers to land owners via the capitalization of program benefits into the value of land eligible for those benefits. This capitalization also raises land prices above the level they would have been in the absence of government programs. This induced change in land prices then affects the mix of resources used to produce products in which land is an input. Other secondary effects on resource allocation also could be avoided if government programs were replaced by options markets.

CONCLUSIONS

The trading of options on agricultural commodities is likely to begin sometime in 1984 under a pilot program supervised by the CFTC. Options fill a gap between futures markets and the price insurance of government programs by offering market participants the opportunity to select the amount of price insurance they desire while, simultaneously, not precluding the opportunity for profits if prices change appreciably.

Although options will never provide the highest level of income that *could* have been earned under an assumption of perfect foresight, marketing strategies that include options establish a minimum price for producers without eliminating the opportunity for gains if market prices increase. Finally, although options and price support programs are alike in many respects, options would provide greater flexibility in choosing a level of price insurance. Further, they are less likely to increase agricultural production or produce the distortions in resource allocation associated with price support programs.

---

[16]See, for example, Michael T. Belongia, "Agricultural Price Supports and Cost of Production: Comment," *American Journal of Agricultural Economics* (August 1983), forthcoming.

[17]Producers do pay — indirectly — if they are required to reduce output to participate in the price support programs.

Two Measures of Reserves: Why Are They Different?

R. ALTON GILBERT

BOTH the Board of Governors of the Federal Reserve System (BOG) and the Federal Reserve Bank of St. Louis (St. Louis) publish series on the reserves of depository institutions that have similar descriptions. Each reserves series is adjusted both for the effects of reserve requirement changes and for seasonal influences.[1]

Though these series have similar descriptions, their growth rates often differ substantially, especially over periods as short as a month (table 1). For instance, in the three years ending in December 1982, the difference between monthly growth rates of the two reserves series (absolute value) averaged 8.6 percentage points. Average differences in growth rates were much smaller over periods longer than a month (chart 1). Absolute value of differences in quarterly growth rates, for example, averaged 3.2 percentage points over the years 1980–82, while the differences in growth rates over four-quarter periods averaged 1.3 percentage points.

The BOG revised its total reserves series in May of this year. That revision primarily reflects new methods of seasonal adjustment. The revision to total reserves (BOG) essentially has no effect on the average difference between growth rates of the two reserves series. For instance, the average difference in monthly

growth rates over the 36 months ending December 1982 was 8.4 percentage points based on data available just before the recent revision in total reserves (BOG), compared with 8.6 percentage points with the revised data.

Large differences in the growth rates of these reserves series make things difficult for those who attempt to monitor the influence of Federal Reserve actions on money growth. Large differences in these growth rates also create public concern that data from one, or possibly both, of the sources have been measured incorrectly; this is especially troublesome during periods when there are major changes in reserve requirements or the activities of depository institutions. The purpose of this paper is to describe the two methods of measuring the monetary base and reserves and to analyze the effects of differences in the methods of measurement on the growth rates of the reserves series.[2]

CALCULATING THE RESERVES SERIES

The St. Louis Series

Basic data: the source base — The basic series used in calculating the St. Louis monetary base and reserves series is the source base; it equals reserve balances of depository institutions with Federal Reserve Banks plus total currency in circulation, whether held by depository institutions or the public. The source base

---

[1]Each of these institutions also publishes a measure of the monetary base. This paper analyzes the reserves series from these two Federal Reserve sources, since financial analysts generally focus on the reserves series in monitoring Federal Reserve actions that influence money growth. For earlier discussions of monetary base and reserves measures, see R. Alton Gilbert, "Revision of the St. Louis Federal Reserve's Adjusted Monetary Base," this *Review* (December 1980), pp. 3–10; John A. Tatom, "Issues in Measuring an Adjusted Monetary Base," this *Review* (December 1980), pp. 11–29; and Albert E. Burger and Robert H. Rasche, "Revision of the Monetary Base," this *Review* (July 1977), pp. 13–28.

[2]The text discusses the procedures for producing these measures of reserves, while the appendix provides a more detailed description. This paper does not select one series as a more appropriate or useful measure of reserves.
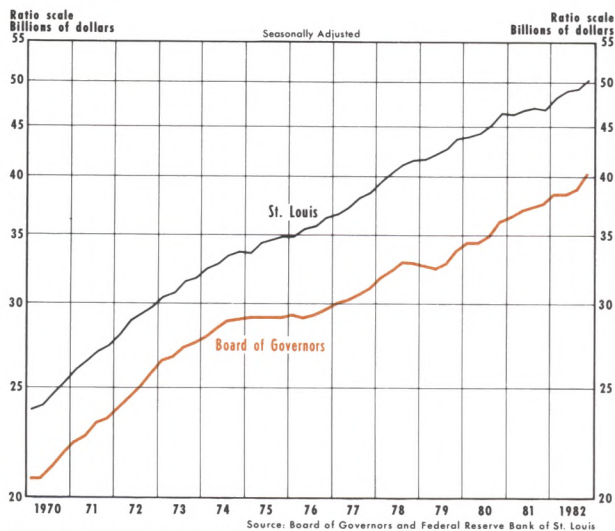
Table 1

Growth Rates of the Reserves Series
(compounded annual rates of change, seasonally adjusted)

Period		St. Louis	Board of Governors		Growth rate of the St. Louis series less the growth rate of the revised BOG series
			Prior to May 1983 revision	After May 1983 revision	
1980	1	−17.5%	7.2%	2.3%	−19.8
	2	18.0	0.0	1.1	16.9
	3	14.6	3.5	2.3	12.3
	4	−2.7	0.0	−0.2	−2.5
	5	−7.8	−9.9	−0.1	−7.7
	6	14.5	7.2	3.2	11.3
	7	2.7	3.5	5.0	−2.3
	8	14.3	14.8	16.8	−2.5
	9	20.3	18.6	10.8	9.5
	10	5.4	3.4	2.5	2.9
	11	36.2	30.6	40.0	−3.8
	12	−24.6	3.3	−6.9	−17.7
1981	1	8.1	0.0	−3.8	11.9
	2	−5.1	0.0	11.7	−16.8
	3	2.6	14.0	21.1	−18.5
	4	8.1	3.3	4.2	3.9
	5	8.0	6.7	16.5	−8.5
	6	2.6	0.0	−0.5	3.1
	7	0.0	3.3	5.5	−5.5
	8	5.2	0.0	1.3	3.9
	9	−9.7	13.7	1.1	−10.8
	10	−2.5	−3.1	−4.5	2.0
	11	5.3	0.0	−0.6	5.9
	12	−2.5	13.5	7.6	−10.1
1982	1	22.6	24.5	8.8	13.8
	2	25.2	−11.7	3.0	22.2
	3	0.0	3.2	7.4	−7.4
	4	2.5	0.0	4.4	−1.9
	5	7.7	3.2	3.7	4.0
	6	15.8	3.2	5.8	10.0
	7	−9.3	−3.1	1.6	−10.9
	8	7.6	9.8	6.3	1.3
	9	2.5	27.8	14.7	−12.2
	10	7.5	9.5	8.7	−1.2
	11	18.2	19.6	15.3	2.9
	12	0.0	12.5	11.7	−11.7
1983	1	12.6	3.0	−17.9	30.5
	2	26.2	−13.7	6.8	19.4
	3	28.6	6.1	21.6	7.0
	4	4.6		9.1	−4.5

is derived from the combined balance sheets of the Federal Reserve Banks and the U.S. Treasury. It reflects the combined actions of the Federal Reserve and the U.S. Treasury that affect the amount of currency held by the public and reserves of depository institutions.

Method of reserve adjustment — The source base, by itself, does not take into account another Federal Reserve action that affects the money stock: changes in reserve requirements. When reserve requirement ratios are lowered (raised), a given amount of source base can support a higher (lower) level of the money

Chart 1
Reserves Series [1]

Source: Board of Governors and Federal Reserve Bank of St. Louis
[1] Each series adjusted for changes in reserve requirements. Data before May 1983 revision are plotted.

stock, holding constant all other factors that influence the relationship between the money stock and the source base.

To reflect the effects of changes in reserve requirements, the source base is adjusted for the amount of reserves released or absorbed by these changes. This adjustment involves adding a reserve adjustment magnitude (RAM) to the source base, which produces a measure called the adjusted monetary base. RAM is simply the difference between what required reserves would have been (given current deposit liabilities) if a base period's reserve requirements were still in effect and the reserves that are actually required (given current reserve requirements). Adding RAM to the source base produces a series that indicates what the source base would have been if the reserve requirement ratios had always been those of the base period.

The adjusted reserves series — The St. Louis Fed derives its adjusted reserves series by subtracting currency held by the public from the adjusted monetary base. Since only currency held by the public is subtracted, vault cash of all depository institutions is included in adjusted reserves.

Seasonal adjustment — The monetary base (source base plus RAM) is seasonally adjusted directly. The adjusted reserves series is adjusted for seasonal influences by subtracting seasonally adjusted currency of the public from the seasonally adjusted monetary base.

Board of Governors Series

Basic data: required reserves plus excess reserves — The staff of the BOG does not use the source base in deriving its monetary base and reserves series. Instead, it calculates the reserves of depository institutions and adds currency to derive a monetary base measure that is similar to one derived directly from the source base.

Total reserves (BOG) include reserve balances of depository institutions at Federal Reserve Banks. Before December 1980, only the vault cash of member banks was included in the BOG reserves series. As noted previously, the St. Louis reserves series includes the vault cash of nonmember commercial banks, even before those institutions became subject to reserve requirements of the Federal Reserve.

Since December 1980, when the reserve requirement provisions of the Monetary Control Act of 1980 were implemented, all depository institutions have been subject to reserve requirements of the Federal Reserve. Since then, the BOG reserves measure includes all reserves (vault cash and reserve balances at Federal Reserve Banks) of depository institutions whose required reserves exceed their vault cash, plus the required reserves of those institutions that hold vault cash in excess of their required reserves. A large proportion of nonmember depository institutions have held vault cash in excess of their required reserves since December 1980, because their reserve requirements are being increased gradually over eight years to those specified in the Monetary Control Act. The difference between their vault cash and required reserves is excluded from the BOG measure of reserves.

Method of reserve adjustment — The BOG staff revises its total reserves series after changes in reserve requirements. For the period since the most recent change in reserve requirements, the reserves series equals the sum of required reserves and excess reserve balances. The total reserves series for the period before the most recent reserve requirement change equals excess reserve balances plus the sum of four required reserves series, each for a different type of institution and type of deposit.

Each of these four series is adjusted for breaks due to changes in reserve requirements by use of a ratio method. When reserve requirements are changed, required reserves for each of the four series affected are calculated using both the new and old reserve requirements. The levels of required reserves prior to the change are multiplied by the ratio of required reserves under the new requirements to required re-

serves under the old requirements.[3] This procedure indicates what reserves would have been if the current structure of reserve requirements had been in effect throughout the entire period, *and* if the deposit mix within each of the four categories was the same as the present deposit mix.

Prior to the revision in May 1983, the seasonally adjusted total reserves series (BOG) was derived as the sum of two series that each were seasonally adjusted plus three other series that were not seasonally adjusted. The two seasonally adjusted components of total reserves (BOG) were (1) required reserves on the net transaction deposits of member banks, and (2) required reserves on the time and savings deposits of member banks. Required reserves on transaction deposits of member banks were calculated by multiplying seasonally adjusted transaction deposits of member banks by the seasonally adjusted average reserve requirement on those deposits. The same method was used to derive seasonally adjusted required reserves on the time and savings deposits of member banks: seasonally adjusted deposits multiplied by their seasonally adjusted average reserve requirements. The following components were included in seasonally adjusted total reserves (BOG) on a not seasonally adjusted basis:

1. Total required reserves of nonmember depository institutions,
2. Required reserves of Edge Act corporations, and
3. Excess reserves.

In the revised series, seasonal factors have been derived directly for required reserves on net transaction deposits of member banks and for required reserves on the time and savings deposits of member banks. The method of multiplying seasonally adjusted deposits by seasonally adjusted average reserve requirements has been discontinued. Also, total required reserves of nonmember institutions are now seasonally adjusted. The required reserves of Edge Act corporations and excess reserves are still included in seasonally adjusted total reserves (BOG) on a not seasonally adjusted basis.

THE EFFECTS OF DIFFERENCES IN SEASONAL ADJUSTMENT

Financial analysts who compare trends in the St. Louis and BOG reserves series typically focus on their

seasonally adjusted growth rates. Since the methods used to seasonally adjust the two reserves series differ considerably, their growth rates can vary widely over periods of a few months due to this difference alone.

The effects of differences in methods of seasonal adjustment can be analyzed by comparing the differences in growth rates of the two seasonally adjusted reserves series to similar differences in growth rates of the data that are not seasonally adjusted. If some of the variation in differences between growth rates of the not seasonally adjusted data reflects differences in seasonal patterns of the two reserves series, which are factored out through seasonal adjustment, the differences between growth rates of the seasonally adjusted reserves series would be less variable. Differences in the methods of seasonal adjustment, however, may amplify rather than dampen the variation in the differences between the growth rates of these series. In this case, variation in differences of seasonally adjusted growth rates would be greater.

The results in table 2 indicate that, using data available before the recent revision in total reserves (BOG), the differences between growth rates of the data that are not seasonally adjusted are less variable. Some of the differences in seasonally adjusted growth rates of the two reserves series observed in recent years, therefore, must be attributed to differences in methods of seasonal adjustment. Table 2 also indicates that the variability of differences between growth rates of the two seasonally adjusted reserves series is smaller in 1980 and 1982 for the revised data, and the same in 1981 for the old and revised data. Thus, the new method of calculating seasonally adjusted total reserves (BOG) tends to reduce variation in the difference between growth rates of the two reserves series. Therefore, differences between monthly growth rates of the two reserves series may be less variable in the future than those differences observed in the past.[4]

_____

[3]Total reserves (BOG) are adjusted for changes in reserve requirements on liabilities of depository institutions other than transaction

or time and savings deposits (such as commercial paper, Eurodollar borrowings and ineligible acceptances) by subtracting from total required reserves the sum of required reserves against these non-deposit liabilities.

[4]As noted in the introduction, the average difference (in absolute value) between monthly growth rates of the two reserves series essentially was unaffected by the revision of total reserves (BOG). The results in table 2, however, indicate that in two of the three years, the standard deviations of the difference between growth rates of the reserves series were reduced by the revision of total reserves (BOG). The revision reduced some of the more extreme differences between monthly growth rates, while increasing differences in other months. During the 36 months ending in December 1982, the number of months in which the growth rates differed (in absolute value) by more than 20 percentage points declined from 5 to 1, but the number of months in which growth rates differed by between 10 and 20 percentage points rose from 6 to 15.

Table 2

Standard Deviation of the Differences between Monthly Growth Rates of the Reserves Series

Year	Using data for total reserves (BOG) available in April 1983		Using revised data for total reserves (BOG) available since May 1983	
	Not seasonally adjusted	Seasonally adjusted	Not seasonally adjusted	Seasonally adjusted
	(1)	(2)	(3)	(4)
1980	13.0	13.3	13.0	11.5
1981	8.9	9.7	8.4	9.7
1982	11.2	14.8	10.6	10.7

The differences between the average seasonal factors of the two reserves series have a seasonal pattern.[5] With data available before the recent revision in total reserves (BOG), the average seasonal factors for adjusted reserves (St. Louis) were higher than those for total reserves (BOG) in January, August, September and December (chart 2). The BOG series tended to grow faster (slower) than the St. Louis series during those months in which the line in chart 2 rises (falls).

With the revised data for total reserves (BOG), the difference between average seasonal factors still has a seasonal pattern, but the seasonal pattern has been changed. The average seasonal factor for adjusted reserves (St. Louis) is especially low relative to that for the revised total reserves (BOG) in January and February. From the relatively low levels for those months, the difference between the average seasonal factors rises to a peak level in August. The pattern of these differences between average seasonal factors in the revised data indicates that total reserves (BOG) will tend to grow faster than adjusted reserves (St. Louis) from around January or February of each year through August, if the differences between seasonal factors continue to have the same pattern as in the past five years.

THE EFFECTS OF DIFFERENCES IN TREATMENT OF VAULT CASH

Vault Cash of Bound Institutions

Institutions with required reserves in excess of their vault cash are referred to as "bound institutions." Their

vault cash is included in the BOG series with a two-week lag, since it is included as reserves available for meeting reserve requirements two weeks after the vault cash is actually held. In contrast, all currency held by the public and depository institutions is included contemporaneously in the St. Louis series.

This difference in accounting for vault cash between the St. Louis and BOG reserves series tends to produce differences in their monthly growth rates. The magnitude of this effect can be estimated by generating reserves series that treat vault cash identically for bound institutions and calculating the extent to which growth rates of the modified series differ. The easiest way to do this is to subtract the monthly average levels of vault cash held contemporaneously by bound institutions from adjusted reserves (St. Louis), not seasonally adjusted, and add their vault cash held two weeks earlier. When adjusted reserves (St. Louis) are modified in this manner, the standard deviation of the difference between the growth rates of the two reserves series over the 24 months ending in December 1982 is reduced by about 22 percent. Thus, the difference in treatment of vault cash at bound institutions produces sizable differences in monthly growth rates of the two reserves series. This effect is reduced, of course, when periods longer than one month are analyzed; the two series differ by only two weeks in their treatment of the timing of vault cash.

Vault Cash of Nonbound Institutions

Some relatively large differences between the monthly growth rates of the two reserves series in the past three years have occurred when the reserve requirements of nonmember institutions were increased: December 1980, September 1981 and

---

[5]The seasonal factors are calculated for each reserves series by dividing the not seasonally adjusted data by the seasonally adjusted data.

Chart 2
Average Difference between Monthly Seasonal Factors for the Reserve Series [1]
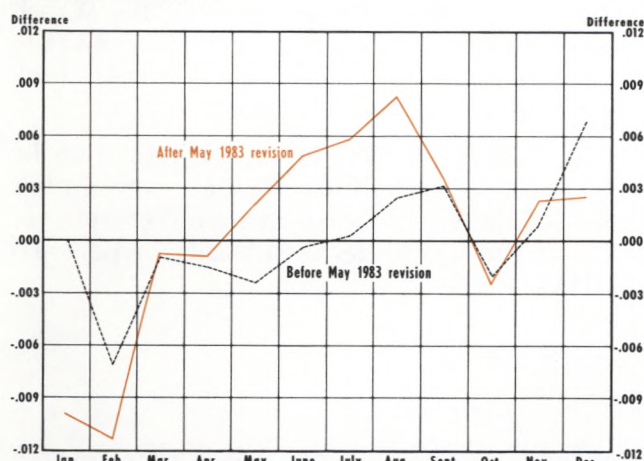
[1] Average monthly seasonal factors for adjusted reserves (St. Louis) less average monthly seasonal factors for total reserves (BOG), 1978-82.

Sources: Federal Reserve Bank of St. Louis and Board of Governors

September 1982.[6] In these months, total reserves (BOG) grew faster than adjusted reserves (St. Louis), with differences in annual growth rates ranging from about 11 to 18 percentage points (table 1).

These large differences in monthly growth rates result from differences in the way the two reserves series are adjusted for the effects of changes in reserve requirements of nonbound institutions (those with vault cash that exceeds their required reserves). The RAM component of adjusted reserves (St. Louis) treats the increase in reserve requirements of nonmembers as a policy action that absorbs reserves by the full amount of the increase in required reserves. The BOG method of calculating total reserves treats only the increase in required reserves of nonmembers *above their holdings of vault cash* as a policy action that absorbs reserves. This difference reduces adjusted reserves (St. Louis) relative to total reserves (BOG) by approximately the amount that excess vault cash declines when nonmember reserve requirements are increased.[7]

―――――――

[6]December 1980 was the first full month in which nonmember depository institutions were subject to reserve requirements of the Federal Reserve.

[7]See the appendix for an algebraic derivation of this result. From August to September 1981, the rise in total reserves (BOG) less the change in adjusted reserves (St. Louis), on a not seasonally adjusted basis, was about $600 million. Excess vault cash declined by about $600 million in September 1981. From August to September 1982, the BOG series rose by about $600 million more than the St. Louis series, approximately equal to the decline in excess vault cash in September 1982. Data on excess vault cash prior to December 1980 are not available.

This explains why relatively large differences between monthly growth rates of the two reserves series have occurred when nonmember reserve requirements have been increased. These differences are directly attributable to the difference in methods of adjusting for the effects of changes in reserve requirements.

A SPECIAL EFFECT: GROWTH IN MONEY MARKET DEPOSIT ACCOUNTS

The rapid growth of money market deposit accounts (MMDAs) also has produced large differences between the growth rates of the St. Louis and BOG reserves series, since those accounts were introduced in mid-December of last year.[8] While MMDAs rose to $320.3 billion in March, time and savings deposits of all depository institutions (not seasonally adjusted), excluding MMDAs, declined by $218.5 billion between last November and March. Although the basic reserve requirements against MMDAs are the same as those against time and savings deposits, the actual required reserves on personal MMDAs at member banks are lower because reserve requirements against MMDAs are not subject to the phase-in that applies to time and savings deposits under the Monetary Control Act of 1980.[9] With a high proportion of MMDAs being in the personal category, and thus immediately exempt from reserve requirements even at member banks, the shift of funds into MMDAs from other categories of time and savings deposits has reduced the average reserve requirement on total time and savings deposits, inclusive of MMDAs.

No adjustment has been made to total reserves (BOG) for the reserves released as a result of growth of personal MMDAs. In contrast, the growth of personal MMDAs has caused the St. Louis RAM to rise. The

―――――――

[8]MMDAs are exempt from maximum interest rates that may be paid by depository institutions. The two major regulations on MMDAs are a minimum denomination of $2,500 per account and a restriction on guaranteeing an interest rate to a depositor for longer than one month. Personal MMDAs (those held by individuals or non-profit organizations) are exempt from reserve requirements, while nonpersonal MMDAs are subject to a 3 percent reserve requirement.

[9]The basic reserve requirements against MMDAs (currently in effect) and against time and savings deposits (after completion of the phase-in) are 3 percent against nonpersonal deposits and zero against personal deposits. At member banks, time and savings deposits were subject to an average reserve requirement of about 3.3 percent prior to the start of the phase-in, which is now 75 percent complete at such institutions.

category of time and savings deposits used in calculating required reserves with base period reserve requirements includes personal and nonpersonal MMDAs. Deposits in this category have risen since MMDAs were authorized, and required reserves have declined. Both changes have contributed to the growth of RAM. Thus, the shift of deposits from those with positive reserve requirements to personal MMDAs generates a release of reserves. The growth of the St. Louis reserves series since mid-December of last year reflects that release of reserves through a rise in the RAM component. The authorization of personal MMDAs — subject immediately to a full phased-in reserve requirement ratio equal to zero — is viewed as a policy action that has resulted in a release of reserves. This treatment reflects the principle that, if the reserve requirements of the base period currently were in effect, a higher source base would be needed to support the existing levels of checkable deposits and time and savings deposits.

This difference in treatment of MMDAs in reserve adjustment has produced substantially different growth rates in the two reserve series in recent months. From November 1982 through March of this year, adjusted reserves (St. Louis) rose at about a 15 percent annual rate, compared with a 4.5 percent growth rate for total reserves (BOG). Data available prior to the May 1983 revision indicated that total reserves (BOG) rose at a 1.5 percent rate from November of last year through March of this year. Thus, the May 1983 revision raised the growth rate of total reserves (BOG), but not enough to narrow substantially the gap between growth rates of the two reserves series over this period of rapid MMDA growth.

The effect of this difference in treatment of MMDAs on the growth of the reserves series can be gauged indirectly by comparing the rise in the RAM since November of last year to the adjustment to total reserves (BOG) for changes in reserve requirements. Total reserves (BOG), not adjusted for changes in reserve requirements and not seasonally adjusted, declined by $3,164 million from November 1982 to March 1983. Total reserves, adjusted for changes in reserve requirements, but not seasonally adjusted, declined by only $449 million over the same period. The

adjustment for changes in reserve requirements, therefore, is $2,715 million. This adjustment reflects primarily the exemption from reserve requirements of the first $2.1 million of reservable liabilities at each depository institution, which became effective in late December, and a phased reduction of member bank reserve requirements in early March.

From November 1982 to March, RAM rose by $4,333 million. Much of the difference between this figure and the $2,715 million figure reflects reserves released through shifts of deposits to personal MMDAs.

CONCLUSIONS

Although the reserves series of the Federal Reserve Bank of St. Louis and the Board of Governors have similar descriptions, they often display substantially different growth rates from month to month and over periods of several months. There are several reasons for these differences. First, different methods are used to seasonally adjust the series. Growth rates of these series can differ substantially over periods of a few months solely for this reason.

Second, some of the largest monthly differences in growth rates of these reserves series during the past three years have occurred when reserve requirements of nonmembers were increased. At those times, the St. Louis measure of reserves declined relative to that of the BOG. This effect is due to differences in the methods used to account for vault cash and to adjust for the effects of changes in reserve requirements.

Finally, the growth of money market deposit accounts, which have been available at depository institutions since mid-December of last year, has raised the growth of the monetary base and reserves series of the St. Louis Fed relative to the BOG series. The growth of MMDAs has produced a release of reserves which has been reflected in the growth of the St. Louis series in recent months. In contrast, no adjustment has been made to the BOG series for the release of reserves that has resulted from the policy action of authorizing MMDAs with a zero reserve requirement.

Appendix

PROCEDURES FOR CALCULATING THE TWO MEASURES OF RESERVES

St. Louis Series

A reserve adjustment magnitude (RAM) is added to the source base (currency in circulation plus reserve balances of all depository institutions at Federal Reserve Banks).[1] The base period for calculating RAM is January 1976 through August 1980. Base period reserve requirements are average reserve requirement ratios of member banks over that period on transaction deposits (12.664 percent) and on total time and savings deposits (3.1964 percent). RAM is calculated each week by multiplying member bank transaction deposits held two weeks earlier by 0.12664, adding 0.031964 multiplied by member bank time and savings deposits held two weeks earlier, and subtracting required reserves of all depository institutions for the current week. Deposit liabilities held two weeks earlier are used in calculating RAM because of lagged reserve requirements, under which required reserves for the current week are based on deposit liabilities held two weeks earlier.

Seasonal factors are calculated for the adjusted monetary base (source base plus RAM). Adjusted reserves on a seasonally adjusted basis are calculated by subtracting currency held by the public, seasonally adjusted, from the adjusted monetary base, seasonally adjusted.

Board of Governors Series

The following description of the BOG total reserves and monetary base series reflects the methods used to derive the series as revised in May 1983. Total reserves, seasonally adjusted (SA), equal the sum of the following series:

(1) Required reserves on net transaction deposits of member banks, SA,

(2) Required reserves on time and savings deposits of member banks, SA,

(3) Total required reserves of nonmember depository institutions, SA,

(4) Total required reserves of Edge Act corporations, not seasonally adjusted (NSA), and

(5) Excess reserve balances held at Federal Reserve Banks, NSA (which excludes required clearing balances).

Each of the four series on required reserves is adjusted for the effects of changes in reserve requirements using a ratio method. At the time of a change in the reserve requirements that apply to one of the four series, required reserves are calculated using the new and the old requirements. Data for that series of required reserves prior to the most recent change in reserves requirements are multiplied by the ratio of required reserves under the new requirements to required reserves under the old requirements.

The seasonally adjusted monetary base is derived as follows:

(1) Total reserves, adjusted for the effects of changes in reserves requirements, SA,

(2) Plus vault cash of nonmember commercial banks, SA,

(3) Minus required reserves of all nonmember institutions held as vault cash, NSA,

(4) Plus excess vault cash of nonmember depository institutions other than commercial banks, NSA,

(5) Plus currency held by the public, SA,

(6) Plus required clearing balances, NSA.

Steps 2 through 5 involve adding components of currency in circulation that are not included in total reserves (BOG). Thus, this measure of the monetary base includes reserve balances plus total currency in circulation.

METHODS OF RESERVE ADJUSTMENT

This section of the appendix describes the basic differences between the two methods of adjusting the

---

[1]Depository institutions maintain clearing balances at Federal Reserve Banks as a means of paying for the fees Federal Reserve Banks now charge for services. Depository institutions receive implicit interest on their clearing balances at the federal funds rate, which may be used to pay the fees on services. Required clearing balances are subtracted in computing the source base because clearing balances are part of total reserve balances held by depository institutions at Federal Reserve Banks, but are not related to the levels of deposit liabilities.

series on the monetary base and reserves of depository institutions for the effects of changes in reserve requirements. To simplify this illustration, the only differences between the St. Louis and BOG series are assumed to be differences in methods of adjusting for the effects of changes in reserve requirements.

The illustration is based on the following assumptions:

1. The liabilities of all depository institutions are subject to one reserve requirement ratio.

2. The base period for the reserve requirement ratio used in calculating RAM (St. Louis series) is designated as period 1; it immediately precedes the current period, designated as period 2.

3. The reserve requirement ratio is different in the current period (period 2) from what it was in the prior period (period 1).

The following symbols are used in describing the methods of reserve adjustment:

r_1, r_2　— the reserve requirement ratio in periods 1 and 2

D_1, D_2 — total deposit liabilities of all institutions in periods 1 and 2

E_1, E_2 — excess reserves of all depository institutions in periods 1 and 2

RAM　— reserve adjustment magnitude (St. Louis series)

SB　　— source base

CP　　— currency in the hands of the public

MBSL — monetary base (St. Louis series)

AR　　— adjusted reserves (St. Louis series)

TRNA — total reserves, not adjusted for reserve requirement changes (BOG series)

TRA　— total reserves, adjusted for the effects of changes in reserve requirements (BOG series)

Calculation of the St. Louis Series

In period 1, RAM is zero, since that is the base period. RAM in period 2 is specified as

$$(1) \quad RAM_2 = r_1 D_2 - r_2 D_2.$$

The source base can be specified as the sum of currency held by the public, required reserves and excess reserves. For period 1,

$$(2) \quad SB_1 = CP_1 + r_1 D_1 + E_1.$$

Since RAM is zero in period 1, the source base is the same as the monetary base. In period 2,

$$(3) \quad MBSL_2 = SB_2 + RAM_2$$
$$= CP_2 + r_2 D_2 + E_2 + (r_1 D_2 - r_2 D_2)$$
$$= CP_2 + r_1 D_2 + E_2.$$

Adjusted reserves are calculated by subtracting currency in the hands of the public from the monetary base:

$$(4) \quad AR_2 = MBSL_2 - CP_2$$
$$= r_1 D_2 + E_2.$$

Calculation of the BOG Series

Total reserves, not adjusted for the effects of changes in reserve requirements, are specified as[2]

$$(5) \quad TRNA_1 = r_1 D_1 + E_1$$

$$(6) \quad TRNA_2 = r_2 D_2 + E_2.$$

For period 2, total reserves not adjusted for the effects of changes in reserve requirements are the same as total reserves adjusted. The method of adjusting for the effects of changes in reserve requirements is applied to total reserves in period 1 as follows:

$$(7) \quad TRA_1 = r_1 D_1 \cdot \left(\frac{r_2 D_2}{r_1 D_2}\right) + E_1$$
$$= r_2 D_1 + E_1.$$

Table A1 summarizes the basic differences between the St. Louis and BOG series in the methods of adjusting for the effects of changes in reserve requirements. For the St. Louis series, adjusted reserves are calculated for period 2 as though the reserve requirement ratio of period 1 was in effect. For the BOG series, total reserves are calculated for period 1 as though the reserve requirement ratio of period 2 was in effect.

IMPLICATIONS OF DIFFERENCES IN TREATMENT OF THE VAULT CASH OF NONBOUND INSTITUTIONS FOR THE RESERVES MEASURES

Depository institutions with vault cash in excess of their required reserves are called nonbound institutions. Their vault cash in excess of required reserves is excluded from the BOG reserves series, but included in the St. Louis series. The difference in treatment of

---

[2]The excess reserves in total reserves (BOG) includes only excess reserve balances at Federal Reserve Banks. Excess vault cash at institutions with greater vault cash than required reserves is excluded from the BOG measure of total reserves, but is included in the St. Louis measure of adjusted reserves. This difference is ignored in this section to simplify the illustration.

Table A1

Methods of Calculating Reserves of Depository Institutions Adjusted for Changes in Reserve Requirements

Period	St. Louis series	BOG series
1	$r_1 D_1 + E_1$	$r_2 D_1 + E_1$
2	$r_1 D_2 + E_2$	$r_2 D_2 + E_2$

vault cash of nonbound institutions causes the St. Louis reserves series to decline relative to the BOG series when the reserve requirements of nonbound institutions increase.

This effect is illustrated under the following assumptions, using some additional terms. Assumptions:

1. The base period for calculating RAM is period 1.

2. Required reserves of nonbound institutions are increased in period 2, but vault cash still exceeds required reserves at all of the previously nonbound institutions.

3. This increase in required reserves of nonbound institutions has no effect on their demand for reserves relative to their deposit liabilities. They have the same level of deposit liabilities and hold the same amount of vault cash in period 2 as in period 1. With higher reserve requirements, they simply have higher required reserves and lower excess vault cash.

4. Bound institutions have the same deposit liabilities and excess reserves in periods 1 and 2.

Additional terms:

r^B — reserve requirement ratio for bound institutions

r_1^N, r_2^N — reserve requirement ratio for nonbound institutions in periods 1 and 2

D_1^B, D_2^B — deposit liabilities of bound institutions in periods 1 and 2

D_1^N, D_2^N — deposit liabilities of nonbound institutions in periods 1 and 2

E_1^B, E_2^B — excess reserves of bound institutions in periods 1 and 2

V_1^N, V_2^N — vault cash of nonbound institutions in periods 1 and 2

Adjusted reserves (St. Louis) in period 1 are given by

$$(8) \quad AR_1 = r^B D_1^B + r_1^N D_1^N + E_1^B + E_1^N.$$

Because nonbound institutions hold all of their required and excess reserves as vault cash, their excess reserves can be expressed as

$$(9) \quad E_1^N = V_1^N - r_1^N D_1^N.$$

Substituting this expression for their excess reserves into the equation for adjusted reserves yields

$$(10) \quad AR_1 = r^B D_1^B + E_1^B + V_1^N.$$

Using the same terms for period 2:

$$(11) \quad AR_2 = r^B D_2^B + E_2^B + V_2^N$$
$$+ (r^B D_2^B + r_1^N D_2^N - r^B D_2^B - r_2^N D_2^N)$$
$$= r^B D_2^B + E_2^B + V_2^N + (r_1^N - r_2^N) D_2^N.$$

By the assumptions above,

$$(12) \quad AR_2 - AR_1 = (r_1^N - r_2^N) D_2^N,$$

which is negative, because r_2^N is larger than r_1^N.

Because total reserves (BOG) exclude excess vault cash, values of that series in periods 1 and 2 can be written as

$$(13) \quad TRA_2 = r^B D_2^B + r_2^N D_2^N + E_2^B$$

$$(14) \quad TRA_1 = r^B D_1^B + r_1^N D_1^N \left(\frac{r_2^N D_2^N}{r_1^N D_2^N}\right) + E_1^B$$
$$= r^B D_1^B + r_2^N D_1^N + E_1^B.$$

Given our assumptions,

$$(15) \quad TRA_1 - TRA_2 = 0.$$

Thus, under our assumptions, a rise in the reserve requirement ratio of nonbound institutions causes adjusted reserves (St. Louis) to decline and total reserves (BOG) to remain unchanged. Since most of the nonbound institutions are nonmembers, this analysis indicates why a rise in reserve requirements of nonmembers tends to reduce adjusted reserves (St. Louis) relative to total reserves (BOG).

The FOMC in 1982: De-emphasizing M1

DANIEL L. THORNTON

THE year 1982 was marked by rapid and variable growth of the monetary aggregates. The growth of M1, the narrow monetary aggregate, was up sharply from 1981, while M2 growth was slightly above the previous year's rate. Of the three targeted aggregates, only M3 growth was lower in 1982 than in 1981. Moreover, 1982 marked the first time since the Federal Open Market Committee (hereafter FOMC or Committee) adopted its new procedures in October 1979 that the fourth-quarter-to-fourth-quarter growth rate of M1 accelerated.[1]

As was the case in 1981, the Committee faced unusual uncertainties regarding the relative behavior of M1 and M2 during the year associated with various technical factors, regulatory changes and financial innovations. Furthermore, the income velocities of the monetary aggregates, especially that of M1, declined relative to their historical norms.[2] Because of these difficulties, the Committee had considerable discussion about the weight that should be assigned to M1

and M2 as a guide to policy. Ultimately, it decided to suspend setting explicit growth objectives for M1 during the fourth quarter of the year. This article will review the factors affecting the long- and short-run policy decisions of the Committee during 1982, including those leading up to the decision to suspend setting an explicit target for M1.

ANNUAL TARGETS FOR 1982

The Full Employment and Balanced Growth Act of 1978 (the Humphrey-Hawkins Act) requires the Board of Governors to transmit to Congress, each February and July, reports on the objectives for growth rate ranges for monetary and credit aggregates over the current calendar year and, in the case of the July report, over the following calendar year as well.[3] The Committee has chosen to establish ranges from the fourth quarter of the previous year to the fourth quarter of the current year.[4]

Note: Citations referred to as "Record" are to the "Record of Policy Actions of the Federal Open Market Committee" found in various issues of the *Federal Reserve Bulletin.*

[1]For a description of the operating procedure, see R. Alton Gilbert and Michael Trebing, "The FOMC in 1980: A Year of Reserve Targeting," this *Review* (August/September 1981), pp. 2–22; and Richard W. Lang, "The FOMC in 1979: Introducing Reserve Targeting," this *Review* (March 1980), pp. 2–25.

[2]The income velocity of a monetary aggregate is given by the ratio of nominal GNP to the aggregate. It indicates the number of times each unit of nominal money "turns over" in producing this year's final output. This conclusion about the record decline in velocity was based on the fact that M1 growth had been rapid in the first quarter compared with what would have been predicted on the basis of the actual behavior of nominal GNP and interest rates. This interpretation was supported by the growth in relatively low-interest-yielding savings deposits. See "Record" (June 1982), pp. 366–67.

[3]These ranges must be reported to Congress each February and July, although the Act provides that the Board and the Committee may reconsider the annual ranges at any time. The period to which the annual ranges apply, however, may not be changed. The base period that the Committee has chosen (the fourth quarter of the previous year) would remain the same even if the Committee decided to change the desired growth rates of the aggregates for the year.

[4]Before 1979, the Committee adopted one-year growth rates each quarter, and the base period for the annual targets announced each quarter was brought forward to the most recent quarter. This method resulted in a problem referred to as "base drift." Growth in aggregates above (below) an annual growth range in a quarter would raise (lower) the base level for calculating the next annual growth path. The specification of annual objectives in terms of calendar year growth rates, which eliminates the base drift problem within a calendar year, does not solve this problem from one calendar year to the next, since new ranges are established from the end of each calendar year.

Organization of the Committee in 1982

The Federal Open Market Committee (FOMC) consists of 12 members: the seven members of the Federal Reserve Board of Governors and five of the 12 Federal Reserve Bank presidents. The Chairman of the Board of Governors is, by tradition, also chairman of the Committee. The president of the New York Federal Reserve Bank is, also by tradition, its vice chairman. All Federal Reserve Bank presidents attend Committee meetings and present their views, but only those presidents who are members of the Committee may cast votes. Four memberships rotate among Bank presidents and are held for one-year terms beginning March 1 of each year. The president of the New York Federal Reserve Bank is a permanent voting member of the Committee.

Members of the Board of Governors at the beginning of 1982 included Chairman Paul A. Volcker, Preston Martin, Henry C. Wallich, J. Charles Partee, Nancy H. Teeters, Emmett J. Rice and Lyle E. Gramley.[1] The following presidents served on the Committee during January and February 1982: Anthony M. Solomon (New York), Edward G. Boehne (Philadelphia), Robert H. Boykin (Dallas), E. Gerald Corrigan (Minneapolis) and Silas Keehn (Chicago). The Committee was reorganized in March and the four rotating positions were filled by: John J. Balles (San Francisco), Robert P. Black (Richmond), William F. Ford (Atlanta) and Karen Horn (Cleveland).[2]

The Committee met eight times during 1982 to discuss, among other things, economic trends and to decide upon the future course of open market operations.[3] As in previous years, however, telephone or telegram consultations were held occasionally between scheduled meetings. During each regularly scheduled meeting, a directive was issued to the Federal Reserve Bank of New York. Each directive contained a short review of economic developments, the general economic goals sought by the Committee, and instructions to the Manager of the System Open Market Account at the New York Bank for the conduct of open market operations. These instructions were stated in terms of short-term rates of growth of M1 and M2 that were considered to be consistent with desired longer-run growth rates of the monetary aggregates.[4] The Committee also specified intermeeting ranges for the federal funds rate. These ranges provide a mechanism for initiating consultations between meetings whenever it appears that the constraint on the federal funds rate is proving inconsistent with the objectives for the behavior of the monetary aggregates.

The Account Manager has the major responsibility for formulating plans regarding the timing, types and amount of daily buying and selling of securities in fulfilling the Committee's directive. Each morning the Manager and his staff plan the open market operations for that day. This plan is developed on the basis of the Committee's directive and the latest developments affecting money and credit market conditions, growth of the monetary aggregates and bank reserve conditions. The Manager then informs staff members of the Board of Governors and one voting president about present market conditions and open market operations that he proposes to execute that day. Other members of the Committee are informed of the daily plan by wire.

The directives issued by the Committee and a summary of the reasons for the Committee actions are published in the "Record of Policy Actions of the Federal Open Market Committee." The "Record" for each meeting is released a few days after the following Committee meeting. Soon after its release, the "Record" appears in the Federal Reserve Bulletin. In addition, "Records" for the entire year are published in the Annual Report of the Board of Governors. The "Record" for each meeting during 1982 included:

1) A staff summary of recent economic developments — such as changes in prices, employment, industrial production and components of the national income accounts — and projections of general price, output and employment developments for the year ahead;

2) A summary of recent international financial developments and the U.S. foreign trade balance;

3) A summary of recent credit market conditions and recent interest rate movements;

4) A summary of open market operations, growth of monetary aggregates and bank reserves, and money market conditions since the previous meeting;

5) A summary of the Committee's discussion of current and prospective economic and financial conditions and the current policy considerations, including money market conditions and the movement of monetary aggregates;

6) Conclusions of the Committee;

7) A policy directive issued by the Committee to the Federal Reserve Bank of New York;

8) A list of the members' voting positions and any dissenting comments;

9) A description of any actions and consultations that may have occurred between the regularly scheduled meetings.

---

[1]Governor Frederick H. Schultz's term expired January 1982. He was replaced by Preston Martin.

[2]Karen Horn took office as President of the Cleveland Bank May 1, 1982, and subsequently became a voting member of the FOMC. Mr. Winn voted as an alternate member in March.

[3]No formal meetings were held in January, April, June or September of 1982.

[4]In October 1982, short-run objectives for M1 were dropped and short-run objectives for M3 were adopted.

Table 1

FOMC Operating Ranges — 1982

Short-Run Operating Ranges					
Date of meeting	Federal funds rate range	Periods to which monetary growth paths apply	M1	M2	M3
February 1–2, 1982	12–16%	January–March	no further growth[1]	around 8%	no range set
March 29–30[a]	no change	March–June	about 3%	about 8%	no range set
May 18[b]	10–15%	March–June	reaffirmed targets		
June 30–July 1[c]	no change	June–September	about 5%	about 9%	no range set
August 24[d]	7–11%	June–September	reaffirmed targets		
October 5[e]	7–10½%	September–December	no specific objective	around 8½–9½%	around 8½–9½%
November 16[f]	6–10%	September–December	no specific objective	around 9½%	around 9½%
December 20–21[g]	no change	December–March	no specific objective	around 9½%	about 8%
Long-Run Operating Ranges					
Date of meeting	Target Period	M1		M2	M3
February 1–2, 1982[h]	IV/81–IV/82	2½–5½%		6–9%	6½–9½%
July 15 (telephone meeting)[i]	IV/81–IV/82	reaffirmed above range		reaffirmed above range	reaffirmed above range

[1]At its December 1981 meeting the Committee set an objective for M1 of "around 4 to 5 percent," however, the surge in M1 growth in January prompted the Committee to set a "no further growth" objective at its February meeting.

At its February meeting, the Committee completed the review, begun at its December 1981 meeting, of the annual targets for the monetary and credit aggregates for 1982. It remained committed to its long-standing goal of restraining the growth of money and credit to reduce further the rate of inflation. Nevertheless, Committee members disagreed about the precise ranges to set for the various monetary aggregates. Most members favored reaffirming the ranges for M1 that had been tentatively adopted at the July 1981 meeting. A substantial number, however, favored a somewhat higher range for M2 based on the belief that various developments during the year would likely boost the growth of M2 relative to M1.[5] Also, it was generally agreed to give considerable weight to M2 in interpreting developments during the year.[6]

In setting its growth range for M1, the Committee argued that the growth in "other checkable deposits," which had accelerated during January and which was in large part responsible for the rapid January growth of M1, was likely to be temporary, and that the relationship between the M1 growth and the nominal GNP growth likely would be closer to its historical pattern during 1982. On this assumption, the Committee argued that it would be acceptable for M1 to grow at a rate near the upper end of its annual range during 1982. The Committee also expected that the growth of M2 would be high in its range, although somewhat below that of 1981.[7] At the end of the discussion, the Committee reaffirmed its tentative ranges for M1 and M2. These ranges are presented in table 1.

---

[5]At its midyear review of the annual ranges, the Committee establishes tentative ranges for the monetary aggregates for the next year — measured from the fourth quarter of the current year to the fourth quarter of the following year.

[6]See "Record" (April 1982), pp. 232–33.

[7]Indeed, the Committee believed that the growth in M2 might meet or exceed the upper end of its range if the personal savings rate grew more rapidly than anticipated, or if depository institutions attracted an exceptionally large flow of funds into IRAs from sources outside of M2. See "Record" (April 1982), p. 233.

Table 1 (continued)

Footnotes — Dissents to FOMC Actions

[a]Messrs. Black and Wallich dissented from this action because they favored specification of somewhat lower rates for monetary growth from March to June than those adopted by the Committee, which would be associated with a relatively prompt return of M1 growth to its range for the year.

Mr. Black believed that continued growth of M1 above its longer-run range for any extended period would adversely affect economic activity by exacerbating inflationary expectations and weakening markets for longer-term securities; for that reason, he felt that it was particularly important to resist any surge in growth of M1 that might develop in April.

In Mr. Wallich's opinion, it would be desirable to restrain the pace of prospective recovery in economic activity consistent with some reduction in the unemployment rate to sustain a degree of pressure for the continuation of the reduction in the underlying rate of inflation.

[b]Mrs. Teeters dissented from this action because she favored specification of somewhat higher rates of monetary growth from March to June with the objective of improving liquidity and easing financial pressures. In her opinion, the time had come to foster lower and less variable interest rates in order to enhance prospects for significant recovery in output and employment.

[c]Messrs. Black, Ford and Wallich dissented from this action because they favored a policy for the period immediately ahead that was firmly directed toward bringing the growth of M1 down to its range for 1982 by the end of the year. They were concerned that accommodation of relatively rapid growth over the summer months might jeopardize achievement of the monetary objectives for the year and thus would risk exacerbating inflationary expectations. Accordingly, they believed that tendencies toward rapid monetary expansion in the months immediately ahead should be met by greater pressures on bank reserve positions and in the money market.

Mrs. Teeters dissented from this action because she favored specification of somewhat higher rates for monetary growth during the third quarter along with an approach to operations early in the period that would clearly signal an easing in policy. In her opinion, policy at this point should be directed toward exerting downward pressure on short-term interest rates in order to promote recovery in output and employment.

[d]Mr. Wallich dissented from this action because he favored an approach to operations early in the period that would lessen the chances of short-term interest rates remaining below the prevailing discount rate or falling further below it. He was concerned that such interest rate behavior would tend to accelerate monetary expansion and that the necessary restraint of reserve growth to curb such expansion might lead to a sizable rebound in short-term rates with adverse implications for business and consumer confidence.

[e]Mr. Black dissented from this action because he preferred to direct operations in the period immediately ahead toward restraining monetary growth. Although he was mindful of the current difficulties of interpreting the behavior of M1, he was concerned that the recent strength in M1 might be followed by still more rapid growth in lagged response to the substantial decline in short-term interest rates that had occurred in the summer, which could require even more restrictive operations later.

Mr. Ford dissented from this action because he preferred a policy for the period immediately ahead that was more firmly directed toward restraining monetary growth, although he recognized that the behavior of M1 in particular would be difficult to interpret. He was concerned that the Committee's policy directive might be misinterpreted in ways that could adversely affect pursuit of the System's longer-run anti-inflationary objectives, particularly in the context of a highly expansive fiscal policy program.

Mrs. Horn dissented from this action because she preferred to continue setting a specific objective for growth of M1, as well as for M2, over the current quarter, notwithstanding the problems of interpreting its behavior. In setting a target for M1, she would tolerate faster growth early in the period, owing to the uncertain impact of the proceeds from maturing all-savers certificates, and would give greater weight to the behavior of M2 for some weeks after the introduction of the new instrument at depository institutions.

[f]Mr. Ford dissented from this action because he believed that it ran the risk of complementing very large budget deficits with substantial increases in the supply of money. In his view, the result would be an overly stimulative combination of policies that could rekindle inflation and drive up interest rates during 1983.

[g]Mr. Black dissented because he preferred to direct policy in the weeks immediately ahead toward ensuring that the growth of M1, abstracting from temporary effects of the introduction of new money market deposit accounts, would moderate from the extremely rapid rate of recent months. While recognizing the difficulties in interpreting M1 currently, he was concerned that excessive underlying growth in that aggregate might reverse the progress achieved in reducing inflation and inflationary expectations and lead to substantially weaker markets for long-term securities.

Mr. Ford dissented from this action because he continued to prefer a policy for the current period that was more firmly directed toward restraining monetary growth, after allowance for the short-run impact of the introduction of new money market deposit accounts. He remained concerned that rapid expansion in the supply of money together with very large budget deficits would produce an overly stimulative combination of policies that could rekindle inflation and inflationary expectations and lead to higher interest rates during 1983 and 1984.

[h]Mrs. Teeters dissented from this action because she believed that somewhat higher monetary growth over the year ahead was needed to promote adequate expansion in economic activity and a reduction in the rate of unemployment. Specifically, she favored a range for M1 that was at least ½ percentage point higher than that adopted by the Committee and a range for M2 that provided for somewhat greater growth in the broader aggregate relative to that in M1.

[i]Mrs. Teeters dissented from this action because she favored an explicit statement that growth of M1 above the upper end of the Committee's range for 1982 by 1 percentage point, or even as much as 1½ percentage points, might be acceptable. In her opinion, it was important to indicate the acceptable degree of growth of M1 above the range in order to foster market behavior that would lower interest rates and enhance the prospects for sustaining recovery in output and employment.

Table 2

Planned Growth of Monetary Aggregates for 1982
(percentage changes, fourth-quarter-to-fourth-quarter)

Aggregate[1]	Actual 1981 growth rate[2]	Proposed range for 1982	Actual 1982 growth rate[2]
M1	5.0%	2.5–5.5%	8.5%
M2	9.5	6.0–9.0	9.9
M3	11.4	6.5–9.5	10.4

[1]M1 is defined as currency plus private demand deposits and other checkable deposits at depository institutions exclusive of deposits due to foreign commercial banks and official institutions, plus travelers checks of non-bank issuers.
M2 is M1 plus savings and small-denomination time deposits at all depository institutions, shares in money market mutual funds, overnight repurchase agreements issued by commercial banks and overnight Eurodollar deposits held by U.S. residents at Caribbean branches of U.S. banks.
M3 is M2 plus large time deposits at all depository institutions and term repurchase agreements issued by commercial banks and savings and loan associations.

[2]Data as revised by Board of Governors in January 1983.

Actual Money Growth in 1982

As shown in table 2, all three of the monetary aggregates exceeded their target ranges during 1982.[8] Their patterns of growth relative to their ranges, however, were considerably different, as can be seen in chart 1. Both M1 and M2 were above their targeted ranges nearly all of the year. In contrast, M3 growth was within its range during the first half of 1982 and above it during the second half.

Although both M1 and M2 were above their target ranges throughout the year, their growth rates displayed different patterns. While the quarter-to-quarter growth of M2 during 1982 was less stable than that of 1981, it was stable compared with the quarter-to-quarter growth of M1. M1 grew rapidly in January and was fairly flat until July, when it began a growth spurt that accelerated markedly in October. This pattern of M1 growth was basically consistent with the Committee's short-run objectives for the year.

SHORT-RUN POLICY DIRECTIVES FOR 1982

The announced annual target ranges for the monetary aggregates provide a basis on which the FOMC

chooses its short-run policy objectives during the year. The short-run policy directives, however, are the ones that influence the *day-to-day* implementation of monetary policy. The Committee issues these directives for implementation by the Manager of the Open Market Account at the Federal Reserve Bank of New York.

During 1982, the Committee specified short-run growth rates for M1, M2 and M3.[9] It also specified intermeeting ranges for the federal funds rate as a mechanism for initiating further consultations in periods between regularly scheduled meetings.[10] These intermeeting ranges and the actual federal funds rate are presented in chart 2. The growth rate targets for the monetary aggregates and the intermeeting ranges for the federal funds rate that the Committee specified during 1982 appear in table 1.

As in the previous year, discussions pertaining to short-run policy decisions in 1982 were marked by considerable uncertainty about both the effect of various regulatory changes and financial innovations on the growth rates of the monetary aggregates and the
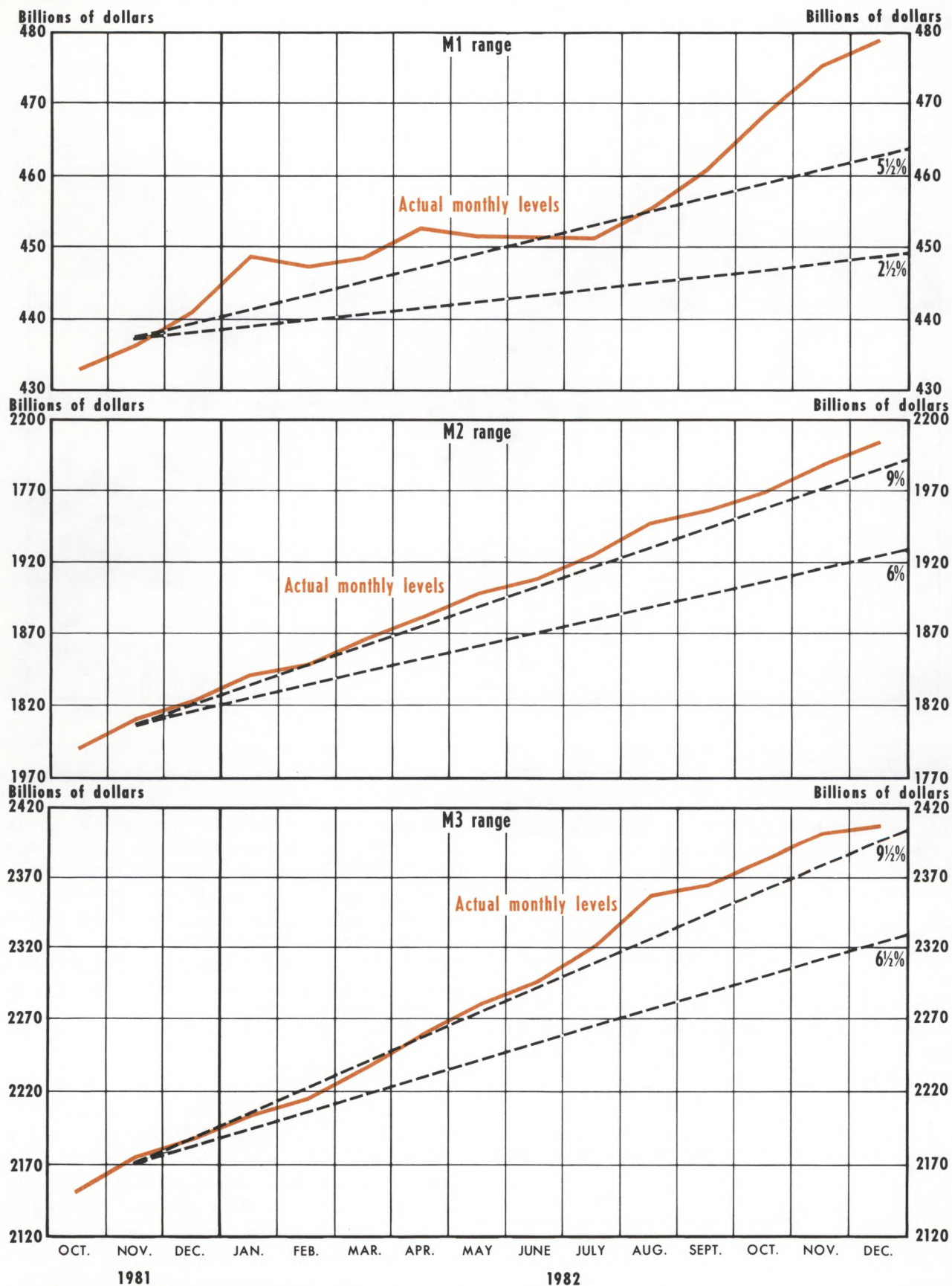
---

[8]The definition of M2 was changed effective February 14, 1983, to include tax-exempt money market funds and to exclude all IRA/Keogh balances at depository institutions and money market mutual funds. These changes also affected M3. Thus, data available January 20, 1983, were used. The growth rates of M1, M2 and M3 will differ from those reported from revisions after February 14, 1983.

[9]The short-run growth rate target for M1 was dropped at the October meeting and a short-run target for M3 was introduced.

[10]If movements of the federal funds rate within the range appear to be inconsistent with the short-run objectives for the monetary aggregates and related reserve paths during the intermeeting period, the Manager of Domestic Operations at the Federal Reserve Bank of New York is to notify the Chairman, who in turn decides whether the situation calls for supplementary instructions from the Committee.

Chart 1

Long-Run Operating Ranges for the Period IV/81-IV/82

Billions of dollars

Billions of dollars

M1 range

Actual monthly levels

5½%

2½%

Billions of dollars

Billions of dollars

M2 range

Actual monthly levels

9%

6%

Billions of dollars

Billions of dollars

M3 range

Actual monthly levels

9½%

6½%

| OCT. | NOV. | DEC. | JAN. | FEB. | MAR. | APR. | MAY | JUNE | JULY | AUG. | SEPT. | OCT. | NOV. | DEC. |

1981

1982

NOTE: Data revised January 1983.

Chart 2

FOMC Ranges for Federal Funds Rate
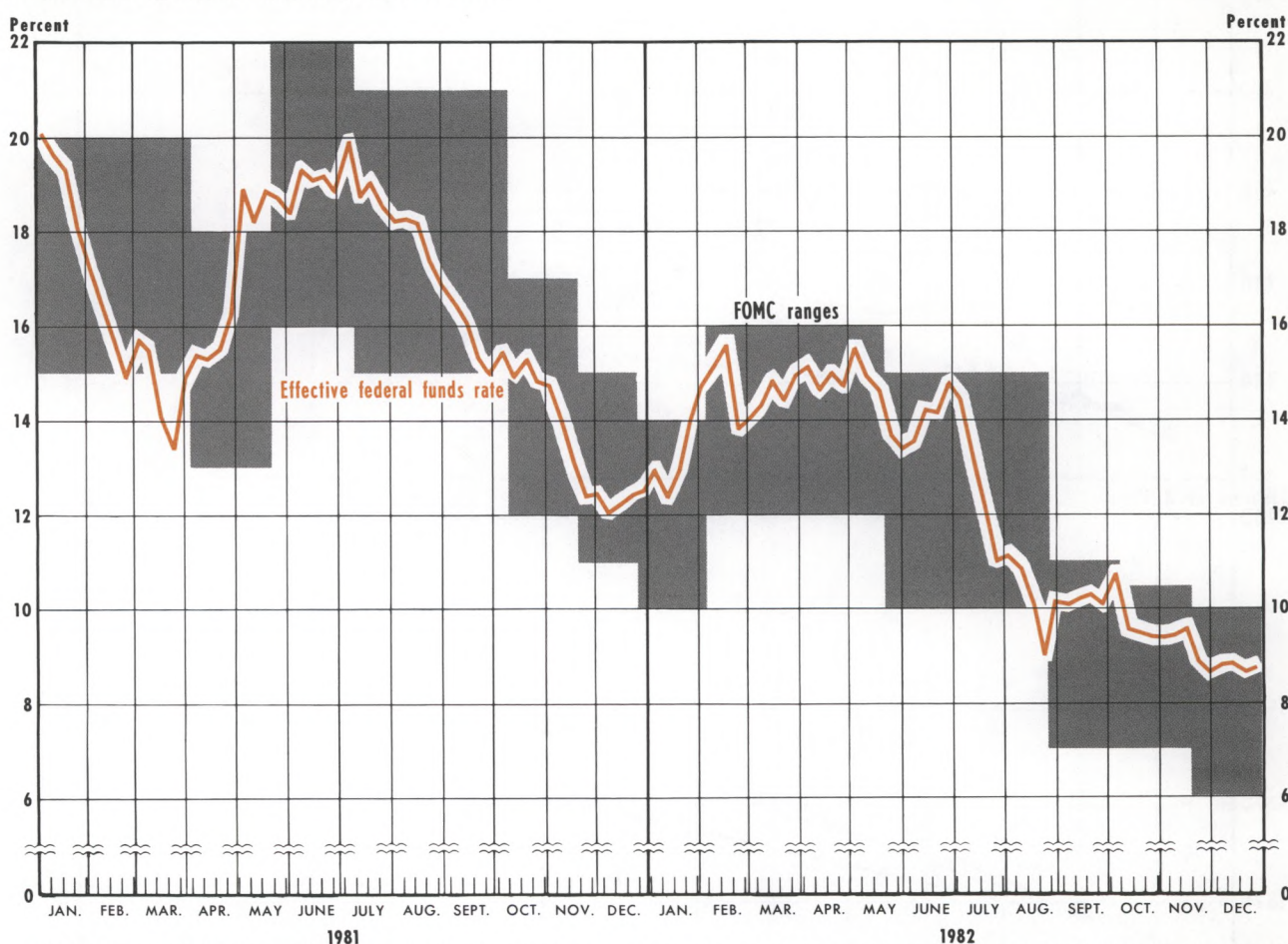
NOTE: Rates are calculated as weekly averages of daily rates. At each meeting the committee specified a range for the federal funds rate. These ranges are indicated for the first full week they were in effect.

relative weight that should be given to M1 and M2 in implementing the Committee's short-run policy decisions.[11] Indeed, the relative importance of M2 and M1 for short-run policy purposes shifted during the year.

Nevertheless, just as in 1981, short-run movements in the aggregates during 1982 followed their short-run target paths. This correspondence between the target paths and actual growth of the aggregates is illustrated in chart 3, which shows the short-run target ranges and actual levels of M1 and M2, respectively, based on first-published data. First-published data give a more

accurate representation of the Committee's short-run policy decisions based on information available at the time.[12] Chart 3 shows that short-run targets for M1 were specified only for the first three quarters of the year. During its October meeting, the Committee decided to place much less weight than usual on the narrow aggregate and not set a specific objective for its growth. At this time, the Committee began setting short-run targets for M3.
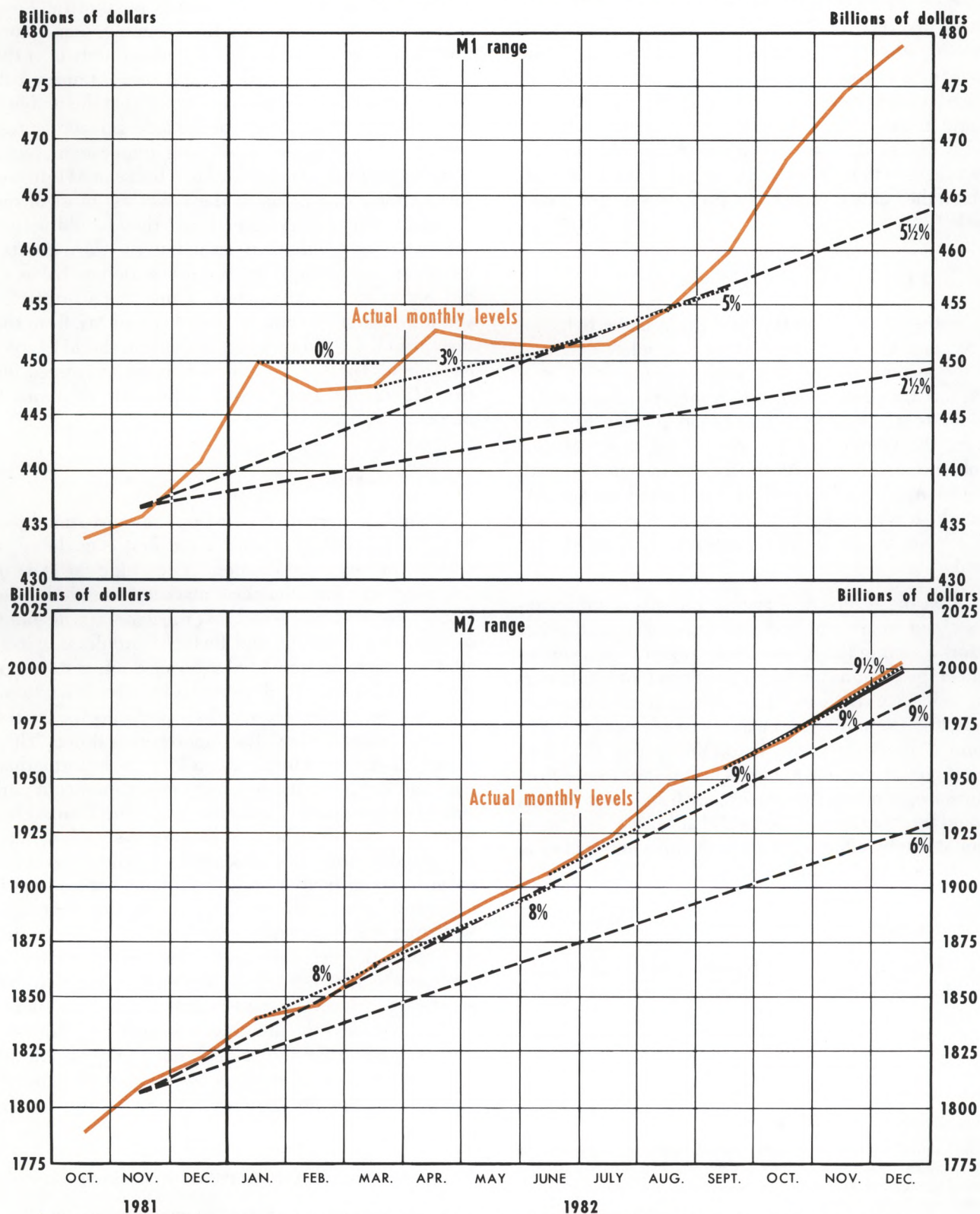
First Quarter

The short-run targets for the first quarter of 1982 were made against a backdrop of rapid expansion in M2 and M1 from November 1981. The growth of both monetary aggregates accelerated during January 1982, especially that of M1. The Committee believed that the rapid growth in the demand for components of M1 would abate during the ensuing months. It noted that if

---

[11]See Daniel L. Thornton, "The FOMC in 1981: Monetary Control in a Changing Financial Environment," this *Review* (April 1982), pp. 3–22.

[12]Because of a definitional change, data for M2 prior to February 5, 1982, are not first-published. Prior to that date, M2 included repurchase agreements and isntitution-only money market mutual funds.

Chart 3

Short-Term and Long-Term Growth Objectives Based on First Published Data

Billions of dollars

M1 range

Actual monthly levels

0%

3%

5%

5½%

2½%

Billions of dollars

M2 range

Actual monthly levels

8%

8%

9%

9½%

9%

9%

6%

OCT. NOV. DEC. | JAN. FEB. MAR. APR. MAY JUNE JULY AUG. SEPT. OCT. NOV. DEC.

1981   **1982**

NOTE: Long dashed lines represent the long-term growth objective for the period IV/81-IV/82. Short dashed lines represent the current short-term growth objectives. Data, except for M2 published before 2/5/82, are first published from the Board's H-6 release. Prior to 2/5/82, M2 included RPs and institution-only MMMFs.

such a decline were not forthcoming, the income velocity of M1 would decline at a postwar record rate, based on the then-projected growth of nominal GNP for the first quarter. Thus, the Committee established growth paths for M1 and M2 that, if achieved, would move these aggregates closer to the upper limit of their annual target ranges. Specifically, the Committee sought no further growth in M1 from January to March and growth of M2 at an annual rate of around 8 percent. It was agreed that some decline in M1 would be acceptable in the context of reduced pressures in the money market.[13]

Second Quarter

Continued uncertainty about the relative behavior of M1 and M2 marked the short-run policy decisions for the second quarter. Staff analysis continued to suggest that the demand for money might be expected to moderate significantly in the second quarter. Furthermore, the Committee was concerned that technical problems associated with the federal income tax deadline in April might result in an April bulge in M1 growth. It was understood that most, if not all, of the M1 growth for the second quarter might occur during April.[14]

Given these technical factors and given uncertainties about near-term economic prospects and other factors affecting the monetary aggregates, most members of the Committee favored actions that would permit modest growth in M1 over the second quarter. Thus, the Committee set a short-run target for M1 of about 3 percent, while maintaining the short-run target growth rate for M2 at its first-quarter rate. Furthermore, it noted that deviations from these targets should be evaluated in the light that M2 was less likely than M1 to be affected by deposit shifts and technical factors over the second quarter.[15]

Third Quarter

In setting its short-run objectives for the third quarter, the Committee noted that the growth of M1 and

M2 for the whole period from March to June appeared to be in line with its objectives for that period (see chart 3). The Committee was increasingly pessimistic, however, about the outlook for the economy, and it continued to be concerned about the uncertainty over the public's demand for liquidity and precautionary balances. Additionally, it was concerned that the midyear reduction in withholding rates for federal income taxes and the scheduled cost-of-living increase in social security payments would lead to a bulge in M1 during July. After a discussion of these factors, most of the Committee members agreed that they would accept somewhat faster monetary growth in the third quarter if the demand for liquidity and precautionary balances did not ease as anticipated. Thus, the Committee voted for faster growth for both M1 and M2 from the second to the third quarter, increasing the M1 target from about 3 percent to about 5 percent and increasing the M2 target from about 8 percent to about 9 percent.[16]

De-emphasizing M1

At the October meeting, when the short-run objectives for the fourth quarter were first considered, a number of new considerations concerning the state of the economy and financial markets emerged. The Committee was concerned that the general worsening of the world economy and financial problems associated with large accumulated external debts of developing countries in recent years had contributed to an atmosphere of uncertainty that was reflected in the exchange value of the dollar, among other things. This, in turn, had serious implications for U.S. export industries and for the ability of foreign governments to pursue flexible monetary policies. Also, the Committee was concerned that the U.S. banking system had been subjected to pressures associated with the general uneasiness about further credit problems both domestically and internationally. The result was a general widening of risk premiums, with interest rates on private securities generally falling less than the rates on Treasury issues from July to September. It noted that short-term interest rates had tended to move up in the weeks just before the meeting. Furthermore, the committee noted that the widely held expectations of a spring or summer recovery had been disappointed, and there were no signs of a strengthening in the economy.[17]

---

[13]See "Record" (April 1982), p. 234.

[14]See "Record" (June 1982), p. 368.

[15]The Committee reevaluated its position for the second quarter at its May meeting. Most members agreed that somewhat more rapid growth of M1 might be acceptable if it appeared to be associated with a continued desire of the public to build up liquidity, and if the growth of M2 was near its specified range. See "Record" (July 1982), p. 420.

---

[16]Three members dissented from this action because they favored a policy of bringing growth of M1 down to its range for 1982 by year-end. See table 1 or "Record" (September 1982), p. 548.

[17]See "Record" (December 1982), pp. 763–64.

With respect to the monetary aggregates, the Committee faced two new concerns: First, a large volume of all-savers certificates would mature in early October. Second, later in the quarter, the Depository Institution Deregulation Committee (DIDC) would implement the Garn-St Germain Depository Institutions Act of 1982 and create an account that would be equivalent to and competitive with money market mutual funds. While the exact nature of this new account and the timing of its implementation were unknown in October, it was known that the new account would be free of interest rate ceilings and would have some degree of usefulness for transaction purposes.[18]

It was believed that the maturing all-savers certificates would induce a temporary increase in M1, while the new money market deposit accounts (MMDAs) would depress M1 growth upon their introduction. Because of these conflicting effects, the Committee believed it would be difficult to interpret movements in M1 during the months ahead.[19] It acknowledged that the new accounts also would affect the growth of M2; however, it believed that M2 and the broader aggregates would be affected to a much smaller extent than M1. Therefore, it decided to set no specific objectives for M1 growth for the fourth quarter, to increase the weight given to M2 and to set short-run policy objectives for M3.

At the November meeting, the Committee acknowledged that the bulge in M1 growth, which it had anticipated, had persisted longer than some members expected, but staff analysis suggested M1 growth could be expected to decelerate over the remainder of the fourth quarter. It was noted, however, that growth of both M1 and M2 could accelerate in the near term due to a buildup of balances for eventual placement in the new MMDAs.[20] The Committee concluded that some-

[18]At the time of this meeting (October 5), the Act had not been enacted (October 15). The Act required implementation of the new account no later than 60 days after taking effect.

[19]There was, however, some reason to believe that the effect of the new money market deposit accounts (MMDAs) on M1 would be minimal. See John A. Tatom, "Money Market Deposit Accounts, Super-NOWs and Monetary Policy," this *Review* (March 1983), pp. 5–16.

[20]By this time, the Committee knew that MMDAs would become effective on December 14, 1982. See "Record" (January 1983), p. 19.

what slower growth in M2 for the fourth quarter would be desirable if such growth were associated with a decline in market interest rates, and that somewhat faster growth would be tolerated if exceptional liquidity demands persisted. Once again, the Committee decided not to set specific policy objectives for M1.

The growth of M2 during the fourth quarter was very near the Committee's short-run objective (see chart 3). The growth of M1, however, was extremely rapid, growing at an annual rate of nearly 14 percent. This rapid fourth-quarter growth of M1 resulted in a fourth-quarter-to-fourth-quarter growth rate of 8.5 percent, well above the upper end of the long-run target range for the year.

SUMMARY

As in 1981, the FOMC argued that a number of financial developments and innovations continued to make it difficult to interpret movements in the two principal monetary aggregates, M1 and M2, during 1982. From the beginning of the year, the Committee believed that M2 was less likely to be affected by these factors than M1. This opinion was bolstered by unusual declines in the income velocity of M1 during the first and fourth quarters of 1982. It was generally felt that considerable weight should be given to M2 in interpreting developments during the year. The Committee increased the weight given to M2 during the year, ultimately dropping M1 as an explicit intermediate policy target for the fourth quarter.

Nevertheless, the growth of both M1 and M2 followed the short-run growth objectives of the Committee fairly closely during the year. Growth of M1 was near the Committee's short-run path until the fourth quarter, when short-run growth objectives for the aggregate were dropped. Actual growth of M2 was near the Committee's desired short-run path for the entire year. Rapid fourth-quarter growth of M1, however, pushed its growth well above the Committee's long-run range.

M1 or M2: Which Is the Better Monetary Target?

DALLAS S. BATTEN and DANIEL L. THORNTON

THE past few years have been marked by financial innovation and deregulation: the rapid growth of money market mutual funds (MMMFs), the nation-wide introduction of NOW accounts (January 1, 1981), the introduction of tax-exempt, all-savers certificates (October 1, 1981) and, most recently, the introduction of the Garn-St Germain money market deposit accounts (December 14, 1982) and super-NOW accounts (January 5, 1983).[1] These changes have led the Federal Open Market Committee (FOMC) to alter the relative weight given to M1 and M2 in its policy deliberations during the past two years.

In 1981, the rapid growth of all-savers certificates prompted the FOMC to lessen the weight assigned to the M1 target relative to the broader monetary aggregate.[2] More recently, the large volume of maturing all-savers certificates and the anticipated introduction of the new money market deposit accounts (MMDAs) prompted the FOMC to give much less weight to M1 at its October 1982 meeting.[3] Many believe that these regulatory changes and financial innovations have increased the substitutability between M1 and non-M1 financial assets, thereby weakening the link between the narrow monetary aggregate and economic activity.

The purpose of this article is to investigate whether the relationship between M1 and nominal GNP has deteriorated and to examine the relative performance of M1 and M2 over recent years.[4] While considerable research effort has been devoted to these questions already, we extend these efforts by (1) using a modified St. Louis-type equation that has performed well based on both in-sample and out-of-sample criteria, (2) considering both in-sample and out-of-sample performances of M1 and M2, (3) examining the role of the non-M1 components of M2 separately, and (4) extending the sample period to include the two most recent financial innovations.[5]

MONETARY AGGREGATES AS INTERMEDIATE POLICY TARGETS

In order for a monetary aggregate to be an appropriate intermediate policy target, there must be a predictable relationship between it and income.[6] To see this, note that the chain of causality for monetary policy runs from the instruments of monetary control to the in-

---

[1]For a discussion of these developments, see Daniel L. Thornton, "The FOMC in 1981: Monetary Control in a Changing Financial Environment," this *Review* (April 1982), pp. 3–22; John A. Tatom, "Recent Financial Innovations: Have They Distorted the Meaning of M1?" this *Review* (April 1982), pp. 23–35; and John A. Tatom, "Money Market Deposit Accounts, Super-NOWs and Monetary Policy," this *Review* (March 1983), pp. 5–16.
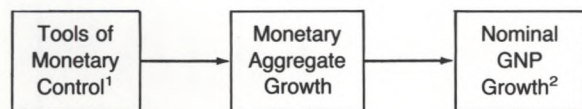
[2]See Thornton, "The FOMC in 1981," p. 15.

[3]See "Record of Policy Actions of the Federal Open Market Committee," *Federal Reserve Bulletin* (December 1982), pp. 761–66; and Daniel L. Thornton, "The FOMC in 1982: De-emphasizing M1," this *Review* (June/July 1983), pp. 26–35.

[4]We should note at the outset that we do not see this as a theoretical debate. The innovations of the past three years could have affected the income and interest elasticities of various financial assets so as to alter the usual relationships between these assets (or simple sum aggregates of these assets, such as M1 and M2) and nominal income. Thus, we believe that the issue is essentially empirical.

[5]For the specification of this modified St. Louis equation, see Dallas S. Batten and Daniel L. Thornton, "Polynomial Distributed Lags and the Estimation of the St. Louis Equation," this *Review* (April 1983), pp. 13–25.

[6]It is argued at times that this link must be stable as well as predictable. As a general rule, however, the less stable the relationship, the less predictable it is as well. Moreover, a stable relationship need not be a numerical *constant* as is often argued in the context of the money-GNP relationship.

Figure 1

Chain of Causality for Monetary Control


```
┌─────────────┐     ┌─────────────┐     ┌─────────────┐
│  Tools of   │     │  Monetary   │     │  Nominal    │
│  Monetary   │ ──▶ │  Aggregate  │ ──▶ │  GNP        │
│  Control¹   │     │  Growth     │     │  Growth²    │
└─────────────┘     └─────────────┘     └─────────────┘
```

[1] Open Market Operations, changes in reserve requirements and the discount mechanism — the discount rate and the administration of the discount window.

[2] The two main goals of policy, full employment and price level stability, are directly linked to nominal GNP growth.

termediate monetary target to the final goal, nominal GNP growth, as illustrated in figure 1. It is usually conceded that M2 is more difficult to control and, hence, the first link in the chain is stronger for an M1 target.[7] Furthermore, there is evidence that the relationship between the growth of the narrow aggregate and nominal GNP growth has been more stable historically.[8]

Recently, however, some have argued that the relationship between M1 and nominal income has become weaker than that between M2 and income.[9] In the context of figure 1, those who now claim that M2 is preferable to M1 must be arguing implicitly that the relationship between M2 and nominal GNP has strengthened sufficiently to offset any policy problems that may result from the difficulty of controlling M2.

---

[7] For example, see R. W. Hafer, "Much Ado About M2," this *Review* (October 1981), pp. 13–18; and Patrick J. Lawler, "The Large Monetary Aggregates as Intermediate Policy Targets," *Voice of the Federal Reserve Bank of Dallas* (November 1981), pp. 1–13.

[8] See Hafer, "Much Ado About M2;" Keith M. Carlson and Scott E. Hein, "Monetary Aggregates as Monetary Indicators," this *Review* (November 1980), pp. 12–21; and Mack Ott, "Money, Credit and Velocity," this *Review* (May 1982), pp. 21–34.

[9] See, for example, Edward P. Foldessy, "New Bank Accounts May Force Fed To End Experiment in Monetarism," *The Wall Street Journal*, December 28, 1982; "The Money Muddle that Clouds the Recovery," *Business Week* (May 16, 1983), pp. 120–21; Vincent G. Salvo, "The Increasing Irrelevance of M1," *International Finance*, The Chase Manhattan Bank (June 6, 1983), pp. 4–5; and Aubrey G. Lanston & Co. Inc., Newsletter (October 4, 12 and 18, 1982). Similar arguments had been made prior to the fourth quarter of 1982. See, for example, Edward Yardeni, "Unlocking The Secrets of The Federal Reserve," E. F. Hutton *Economics Alert* (June 26, 1981); Irwin L. Kellner, "Breaking the Gridlock," The Manufacturers Hanover *Economic Report* (September 1981); William N. Griggs and Leonard J. Santow, *The Schroder Report* (August 17, 1981); and Irving Kristol, "The Trouble with Money," *The Wall Street Journal*, August 26, 1981.

The Relationship Between Money and GNP

The relationship between a monetary aggregate and economic activity can be summarized by the following equation:

$$MV = Y,$$

where M is a monetary aggregate, V is the income velocity of money (that is, the rate at which money changes hands in the purchase of final goods and services) and Y is nominal GNP.

This relationship is viewed frequently in terms of growth rates. That is,

$$\dot{M} + \dot{V} = \dot{Y},$$

where the dots over each variable indicate compounded annual growth rates. From this representation, it is clear that the predictability of the relationship between a change in money growth and a subsequent change in GNP growth depends crucially on the predictability of the rate of growth of velocity.

For the past two decades, M1 velocity has been growing at an average rate of approximately 3 percent while, on average, M2 velocity has not grown at all. This is illustrated by chart 1, which contains the four-quarter growth rates of M1 and M2 velocities. The time path of M1 velocity growth oscillates around 3 percent, and the path of M2 velocity growth fluctuates around zero. During the past year and a half, however, the growth of each of these velocities has declined dramatically. As a result, the link between these aggregates and GNP appears to have become weaker. Because the behavior of both velocities have been so similar, however, casual observation is insufficient to determine which of these relationships has deteriorated more.

AN ECONOMETRIC INVESTIGATION

An econometric analysis of the relationship between money growth and economic activity involves the use of a version of the St. Louis equation. The St. Louis equation was developed to investigate the impact of monetary and fiscal actions on nominal economic activity (measured by the growth of nominal GNP). The equation usually is written as:

$$(1) \quad \dot{Y}_t = \alpha_0 + \sum_{i=0}^{J} \beta_i \dot{M}_{t-i} + \sum_{i=0}^{K} \gamma_i \dot{G}_{t-i} + \varepsilon_t,$$

where $\dot{Y}$, $\dot{M}$ and $\dot{G}$ are the compounded annual growth rates of GNP, a monetary aggregate and high-employment government expenditures, respectively.

Chart 1
Growth Rates of M1 Velocity and M2 Velocity [1]
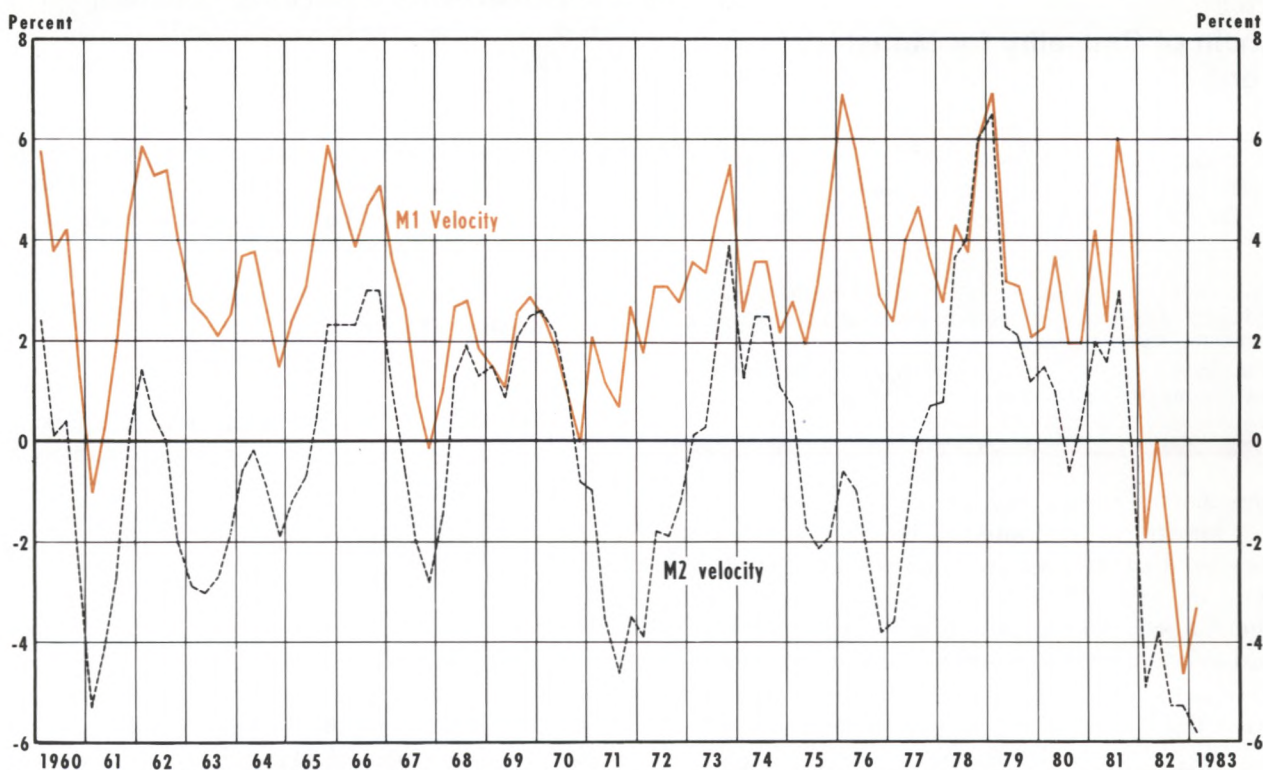
[1] Each line represents a four-quarter growth rate.

In this article, the appropriate lag lengths (J, K) are selected using an orthogonal regression procedure.[10]

Table 1 contains the results of estimating equation 1 over three sample periods — II/1962 to III/1982, II/1962 to IV/1982 and II/1962 to I/1983 — using either M1 or M2 as the monetary aggregate. Because the observed velocity behavior of both M1 and M2 have been unusual during the past two quarters (IV/1982 and I/1983), this stepwise augmentation of the sample period was employed to isolate the impact of these occurrences on the explanatory power of equation 1.[11]

Several points of comparison are of interest. First, the M1 equation explains 48 percent of the variation in

nominal GNP growth in the II/1962–III/1982 period, while the M2 equation explains only 26 percent. The explanatory power of each equation, however, deteriorates substantially when the last two quarters of data are added. In relative terms, the decline in explanatory power is about the same for each aggregate; consequently, the absolute explanatory power of the M1 equation remains greater than that of the M2 equation when the last two quarters are included. Second, a 1 percentage-point change in the growth of either M1 or M2 ultimately leads to a 1 percentage-point change in GNP growth, regardless of the sample period. Finally, the cumulative impact of a change in high-employment government spending is not statistically significant in either equation for any sample period.

---

[10]See Batten and Thornton, "Polynomial Distributed Lags." The lag lengths chosen are 10 for $\dot{M}1$ and 9 for $\dot{G}$ in the M1 equation, and 11 for $\dot{M}2$ and 2 for $\dot{G}$ in the M2 equation.

[11]Furthermore, an iterative analysis of several subsample periods was conducted beginning with the subsample period II/1962–IV/1979 and iterating (adding one quarter at each iteration) until the full sample period, II/1962–I/1983, was reached. The only indication of any deterioration in the explanatory power of either equation occurred when IV/1982 was added to the sample.

In-Sample and Out-of-Sample Forecasts

To investigate the possible impact of financial innovations and regulatory changes in-sample root mean square errors (RMSEs) are calculated for two sub-

Table 1
Ordinary Least Squares Estimates of the St. Louis-Type Equation

		Sample Period		
		II/1962–III/1982	II/1962–IV/1982	II/1962–I/1983
M1 EQUATION				
Summed Coefficients	Lags			
$\dot{M}$	10	1.150* (4.52)	1.096* (3.92)	0.952* (3.43)
$\dot{G}$	9	−0.042 (0.31)	−0.090 (0.61)	−0.047 (0.31)
Summary Statistics				
$\bar{R}^2$		0.48	0.38	0.34
SE		3.16	3.48	3.56
DW		2.12	1.97	1.89
M2 EQUATION				
Summed Coefficients				
$\dot{M}$	11	1.310* (4.64)	1.291* (4.35)	1.281* (4.38)
$\dot{G}$	2	0.066 (0.76)	0.042 (0.46)	0.041 (0.46)
Summary Statistics				
$\bar{R}^2$		0.26	0.19	0.19
SE		3.77	3.97	3.94
DW		1.91	1.79	1.85

Note: Absolute values of t-statistics in parentheses.
*Statistically significant at the 5 percent level.

periods, before and after I/1980.[12] (These RMSEs are computed for each of the three estimations of the M1 and M2 equations presented in table 1.) The latter period was chosen as the period within which the most important financial innovations and regulatory changes have occurred. These results are reported in table 2. They reveal two important facts: First, the in-sample explanatory performance of M1 during the I/1980–III/1982 period actually improved somewhat compared with the period II/1962–IV/1979, while that of M2 deteriorated. Second, when the last two quarters are added to the second period, the performance of each aggregate deteriorates. The performance of M1, although still better than that of M2, does degenerate relative to that of M2. For example, the RMSE of the M1 equation for the I/1980–I/1983 period is 66 percent larger than that for the I/1980–III/1982 period, while the same comparison for the M2 equation yields only a 9 percent increase in the RMSE.

A comparison of out-of-sample forecasts of the equations yielded results similar to those cited above.[13] The

[12]The in-sample RMSE is defined as:

$$\sqrt{\frac{\sum_{i=1}^{n_j} e_i^2}{n_j}}$$

where e_i is the ith residual and n_j is the number of observations in the jth subsample.

[13]Since the imposition of polynomial restrictions tends to smooth the distributed lag weights and, thus, tends to improve the accuracy of out-of-sample forecasts, these restrictions are imposed in both of the out-of-sample experiments. The appropriate polynomial degrees are chosen using the methodology presented in Batten and Thornton, "Polynomial Distributed Lags." The degrees selected are 6 for M1 and 3 for $\dot{G}$ in the M1 equation, and 5 for $\dot{M}2$ in the M2 equation; no polynomial restrictions are imposed on $\dot{G}$ in the M2 equation.

Table 2

In-Sample Root Mean Square Errors

Period	Equation	
	M1	M2
II/1962–IV/1979	2.73	3.09
I/1980–III/1982	2.50	4.86
II/1962–IV/1979	2.82	3.12
I/1980–IV/1982	3.77	5.53
II/1962–IV/1979	2.81	3.12
I/1980–I/1983	4.16	5.32

Table 3

Out-of-Sample Root Mean Square Errors

Forecast Period	Equation	
	M1	M2
I/1980–III/1982	4.57	5.85
I/1980–IV/1982	7.06	6.22
I/1980–I/1983	6.93	5.99

experiment conducted was to estimate each equation over the period II/1962–IV/1979 and to forecast GNP growth to the end of the sample period. The out-of-sample RMSEs were calculated for three forecast periods — I/1980 to III/1982, I/1980 to IV/1982 and I/1980 to I/1983 — to demonstrate the impact that the last two quarters have on the forecasting accuracy of each equation. These results are reported in table 3, and the individual errors are presented in chart 2. The evidence indicates that, until the last two quarters, the M1 equation was more accurate in out-of-sample forecasting. When the last two quarters are included, however, the performance of M1 deteriorates significantly while that of M2 remains essentially unchanged. In fact, the initial relative success of the M1 equation vanishes completely when the last two quarters are considered.

These results reveal that the link between M1 growth and GNP growth remained strong up to the fourth quarter of 1982. Thus, the contention that this relationship had deteriorated prior to the unusual occurrence of IV/1982 appears to be without substance.[14] Both the in-sample and out-of-sample performances of the M1 equation are considerably better than those of the M2 equation. Thus, there is no evidence to support the contention that the relationship between M2 and income became stronger relative to that of M1 and income before IV/1982. The performance of M1, however, appears to be more adversely affected by the developments of the last two quarters. Even though there is evidence to indicate a recent deterioration in the M1-GNP relationship relative to the M2-GNP re-

lationship, this period is too short to ascertain whether this change is temporary or permanent.

Analysis of the Non-M1 Components of M2

By definition, M2 contains M1 plus certain other financial assets.[15] Thus, implicit in the argument that M2 is preferable to M1 is the assumption that the non-M1 components of M2 (NM1) provide additional explanatory power over that of M1 alone. Furthermore, the non-M1 components of M2 have characteristics which differ, in some cases markedly, from those of M1. Consequently, the marginal impacts of the M1 and the non-M1 components of M2 upon economic activity may vary significantly.[16] In order to capture the possibility of this differential impact, the growth of the non-M1 components of M2 is included separately with the growth of M1 in equation 1. Estimates from this augmented equation are given in table 4 for the three sample periods used previously.[17]

The inclusion of the non-M1 components has little effect on the performance of the equation: the standard errors and adjusted R^2s are about the same for comparable sample periods. More importantly, neither the hypothesis that the cumulative impact of the growth of the non-M1 components is zero nor the joint hypothesis that all of these coefficients are zero can be re-

---

[14]Toida and Gavin also find that M1 is preferable to M2 as an intermediate target. See Mitsuru Toida and William T. Gavin, "Non-nested Specification Tests and the Intermediate Target For Monetary Policy," Federal Reserve Bank of Cleveland Working Paper No. 8301 (June 1983).

[15]These other assets are savings (including MMDAs) and small denomination time deposits at all depository institutions, overnight repurchase agreements at commercial banks, overnight Eurodollars held by U.S. residents other than banks at Caribbean branches of member banks and balances of money market mutual funds (general purpose and broker/dealer).

[16]The marginal influences of both sets of components are assumed implicitly to be the same in the estimation of the M2 equation because the coefficients of both sets are constrained to be identical.

[17]The lag lengths selected for the augmented equation are 10 for M1, 9 for G and 11 for NM1.

Chart 2
Out-of-Sample Forecast Errors of Alternative St. Louis-Type Equation Specifications
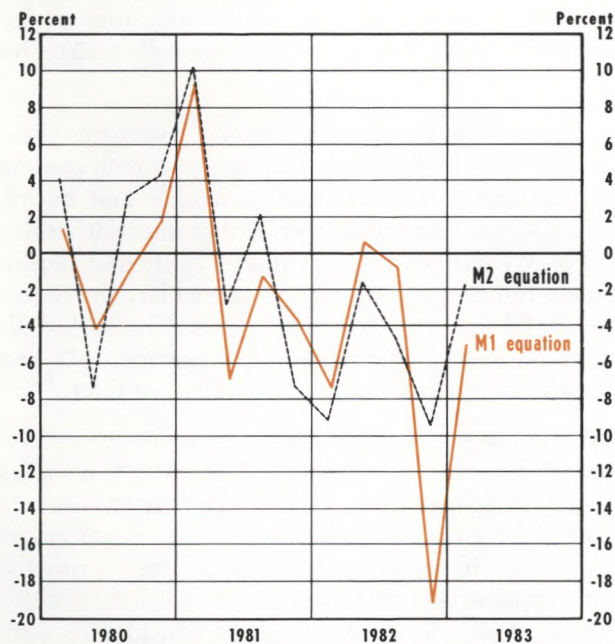Actual minus Predicted Values

Chart 3
In-Sample Residuals of Alternative St. Louis-Type Equation Specifications
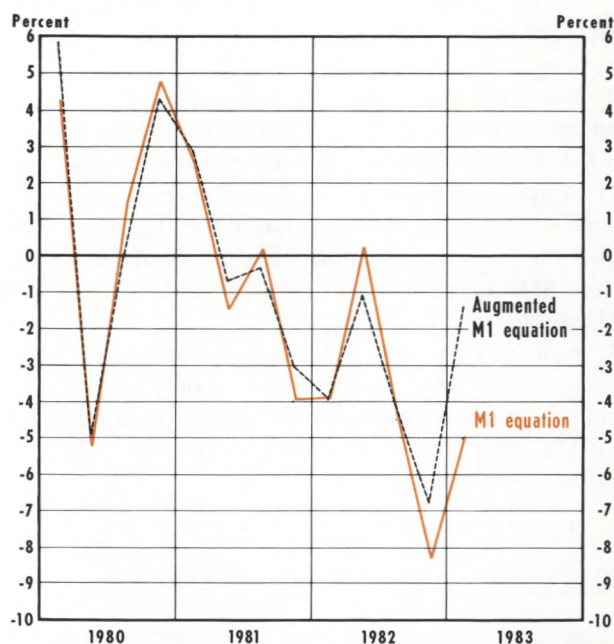Actual minus Predicted Values

Table 4

Ordinary Least Squares Estimates of the Augmented St. Louis-Type Equation

	Sample Period		
	II/1962–III/1982	II/1962–IV/1982	II/1962–I/1983
SUMMED COEFFICIENTS			
$\dot{M}1$	1.050*	1.004*	0.955*
	(3.79)	(3.29)	(3.22)
$N\dot{M}1$	0.316	0.339	0.356
	(1.31)	(1.28)	(1.36)
$\dot{G}$	−0.047	−0.082	−0.074
	(0.32)	(0.51)	(0.46)
SUMMARY STATISTICS			
$\bar{R}^2$	0.46	0.35	0.35
SE	3.23	3.56	3.55
DW	2.20	2.03	2.05

Note: Absolute values of t-statistics in parentheses.

*Statistically significant at the 5 percent level.

jected at conventional significance levels during any of the three periods.[18] Thus, the non-M1 components of M2 provide no additional power over M1 alone in explaining the variation of nominal GNP.

A closely related issue concerns whether the explanatory power of the non-M1 components of M2 has improved as financial innovation has progressed. Chart 3 contains the in-sample residuals of the M1 equation and the augmented M1 equation for the period I/1980–I/1983. If the additional explanatory power of the non-M1 components has improved during this period, one would expect to see the residuals of the augmented M1 equation becoming smaller relative to those of the initial M1 equation. The residuals of the augmented M1 equation do appear to be smaller than those of the M1 equation for the last three quarters. In other words, while these results provide only preliminary evidence, they do indicate that the performance of the non-M1 components may have improved during the past two or three quarters.

SUMMARY AND CONCLUSIONS

Financial innovation in the 1980s has led many to believe that the relationship between M1 growth and GNP growth has deteriorated relative to that between M2 growth and GNP growth. Although this is a con-

ceptual possibility, an empirical investigation provides mixed support for this contention. It is clear that, within the framework of the version of the St. Louis equation presented here, M1 growth explains more of the variation of nominal GNP growth than M2 growth and that there was no marked deterioration in the M1-GNP relationship prior to the fourth quarter of 1982.

Drawing conclusions from summary statistics of explanatory power, however, confuses past with present performance. An analysis of in-sample and out-of-sample forecasting errors reveals that the relative success of M1 has been due primarily to its past performance, not its present one. In particular, the occurrences of the past two quarters have had a substantially larger impact on the relationship between M1 and nominal GNP than that between M2 and GNP.[19]

While this evidence should promote continued review of the relative merits of M1 and M2, it does not seem sufficient, at present, to conclude that M1 should be de-emphasized as an intermediate target of monetary policy. If subsequent empirical studies provide more conclusive evidence to support this tentative finding, then policymakers should consider changes that will enhance their ability to control M2.

---

[18]The F-statistics calculated to test the hypothesis that all of the coefficients of NM1 are zero in each of the three periods are 0.77, 0.76 and 1.06, respectively, well below the critical value of 1.95 at the 5 percent significance level.

[19]It should be noted that even though recent financial innovations and deregulation have motivated this study, the findings do not necessarily indicate that these innovations and regulatory changes have been the cause of the results obtained. In fact, much of the innovation and deregulation that has occurred predated the time period during which the changes in explanatory power have been identified.