Economic Review

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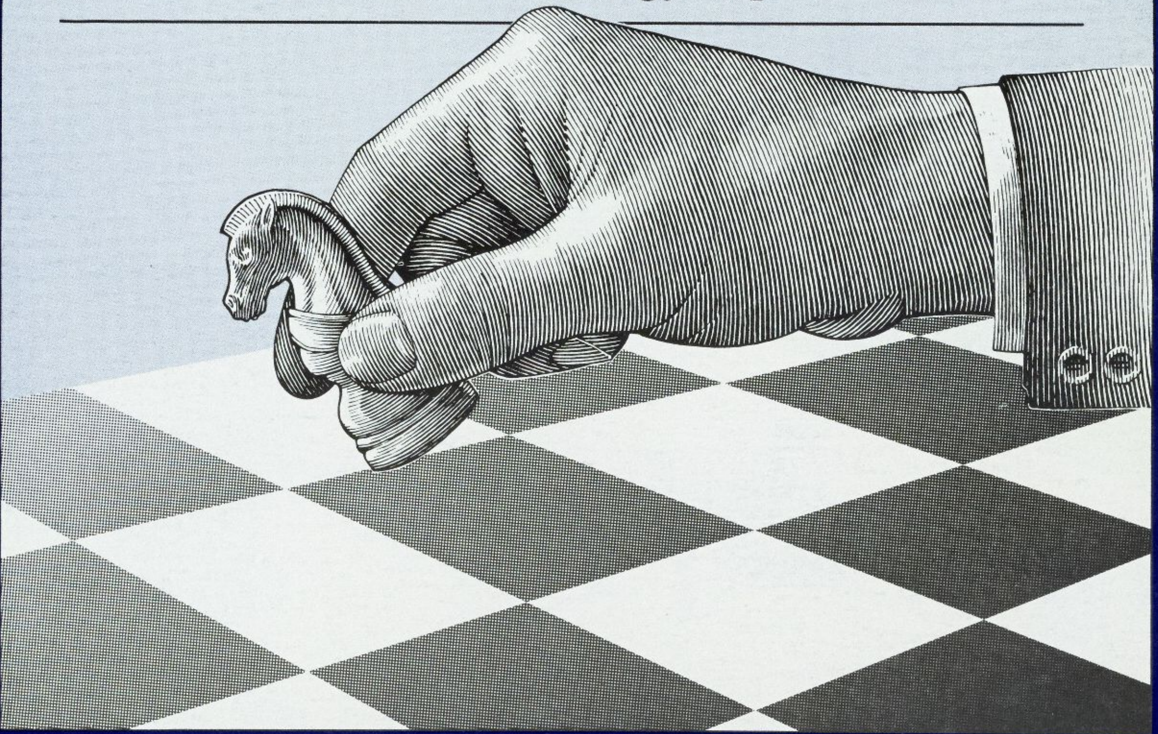

Economic Review

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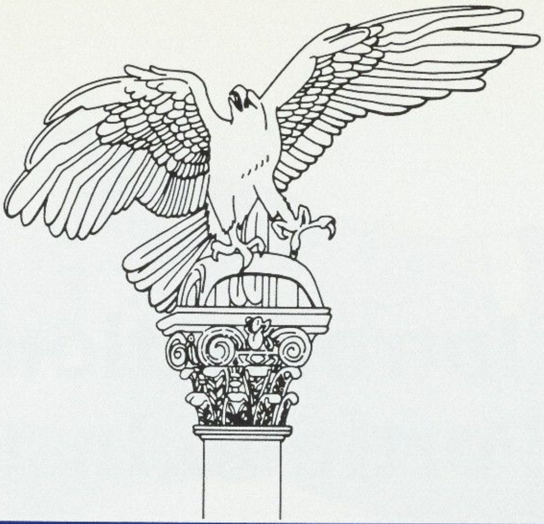

An Introduction to Portfolio Insurance

Peter A. Abken

Portfolio insurance is distinguished from other types of hedging by its continuous adjustments of the investment position. Like other forms of hedging, however, portfolio insurance does not perform perfectly, as was amply demonstrated during the stock market crash of October 19.

The stock market crash on October 19, 1987, and subsequent market turmoil heated up debate over two relatively new trading techniques, stock-index arbitrage and portfolio insurance. While both are types of so-called program trading that involve use of stock-index futures contracts, stock-index arbitrage has come to be the better known of the two. This article attempts to demystify portfolio insurance by explaining this portfolio management technique and by illustrating its performance in recent market history. Consideration is also given to whether, as some market observers allege, portfolio insurance destabilized the stock market and exacerbated the crash.

Portfolio insurance (PI) programs have been offered by major banks, brokerage firms, insurance companies, and specialized PI firms. These insurance programs have attracted large institutional users, primarily pension funds. Compared with the potential market, however, portfolio insurance is still relatively obscure. Before the stock market crash in October 1987, estimates of asset values covered by portfolio insurance programs ranged from $60 billion to $100 billion. Even so, insured portfolios constituted only a small percentage of total pension fund assets.

This article presents the basic theoretical and practical aspects of portfolio insurance. It also reports simulations of portfolio insurance using the Standard and Poor's (S&P) 500 index as the underlying portfolio. Two different kinds of PI implementations are considered: the index/Treasury bill and index/futures methods. The latter is of particular interest both because it is the actual method most commonly used and because the literature on portfolio insurance has not treated it in any depth. The article concludes with a discussion of the recent controversy surrounding portfolio insurance.

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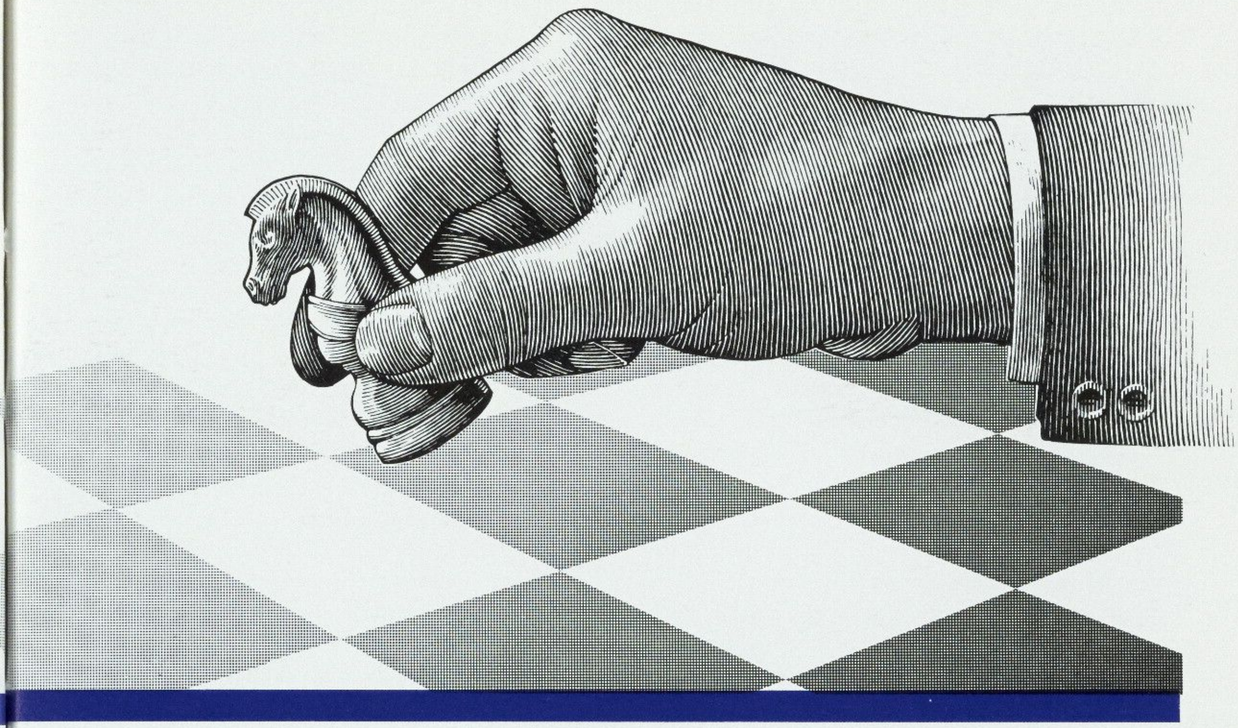
Hedging Instruments

A review of the underlying financial instruments facilitates discussion about portfolio



insurance. The standard means for implementing portfolio insurance strategies uses stock-index futures contracts, usually the S&P 500 contract traded on the Chicago Mercantile Exchange (CME). An alternative to this approach would be simply to employ stock-index option contracts. Both futures and option contracts are referred to as derivative assets because their value depends on the value of an underlying asset, in this case a unit of the S&P 500 index.[1] A unit or "share" of the S&P 500 index is a portfolio of stocks that is identical in composition to the index. In general, a futures contract establishes a certain price at the time of purchase (sale) for deferred delivery of a specified quantity of a commodity or asset. By purchasing an S&P 500 futures contract, which is referred to as taking a *long* position in the contract, the buyer is obligated to take future delivery of the cash value of the S&P 500 index upon expiration of the contract.[2] Selling a contract, or taking a *short* position, binds the seller to pay the cash value. The obligation to make actual payment can be nullified at any time if an investor simply takes an opposite position in futures; for example, an investor could buy a futures contract if one had been previously sold, and vice versa. Gross profit on a long or short futures position solely depends upon the difference between the value of the initial futures position and its final value.

The usefulness of stock-index futures for hedging the value of a portfolio will be discussed below in detail. For now, suffice it to say that the essence of a hedging operation entails taking a futures position whose value is negatively correlated with the asset or commodity being hedged. Suppose, for instance, that a portfolio manager wants to protect a portfolio from a drop in value until some future date when the portfolio will be sold. The manager could sell stock-index futures that expire at the time he intends to liquidate the portfolio, so that for every dollar the portfolio loses (gains) in value, the short futures position gains (loses) a dollar. Obviously, although this procedure entails no risk of loss, it also presents no opportunity for gain. Using futures in this way sacrifices all "upside" potential for the portfolio. In fact, as will be demonstrated below, holding a short futures position against a portfolio is equivalent to liquidating the portfolio and holding only cash, or more precisely, holding a risk-free asset.

A portfolio's upside potential is retained by a stock-index put option, which gives the purchaser the *right* but not the *obligation* to sell the underlying units at a specified price upon expiration of the contract. (A call option gives the purchaser the corresponding right to buy.) The price specified in an option contract is known as the exercise or striking price. For an index option, the exercise price is a particular index value.

Unlike futures contracts, option contracts offer asymmetric payoffs. For example, the value of a portfolio of stocks held along with a stock-index put option may fall below the exercise price at the time of the option's expiration. This portfolio loss will result in an opposite, offsetting gain in the value of the put option, an outcome similar to that for a short index futures position. However, a rise in the portfolio's value above the exercise price is offset only by the cost of the option. Thus, this kind of option strategy, commonly known as a protective put, both "insures" a portfolio and permits it to participate in rising markets. The price of the option, or the option premium, represents the cost of the portfolio insurance.

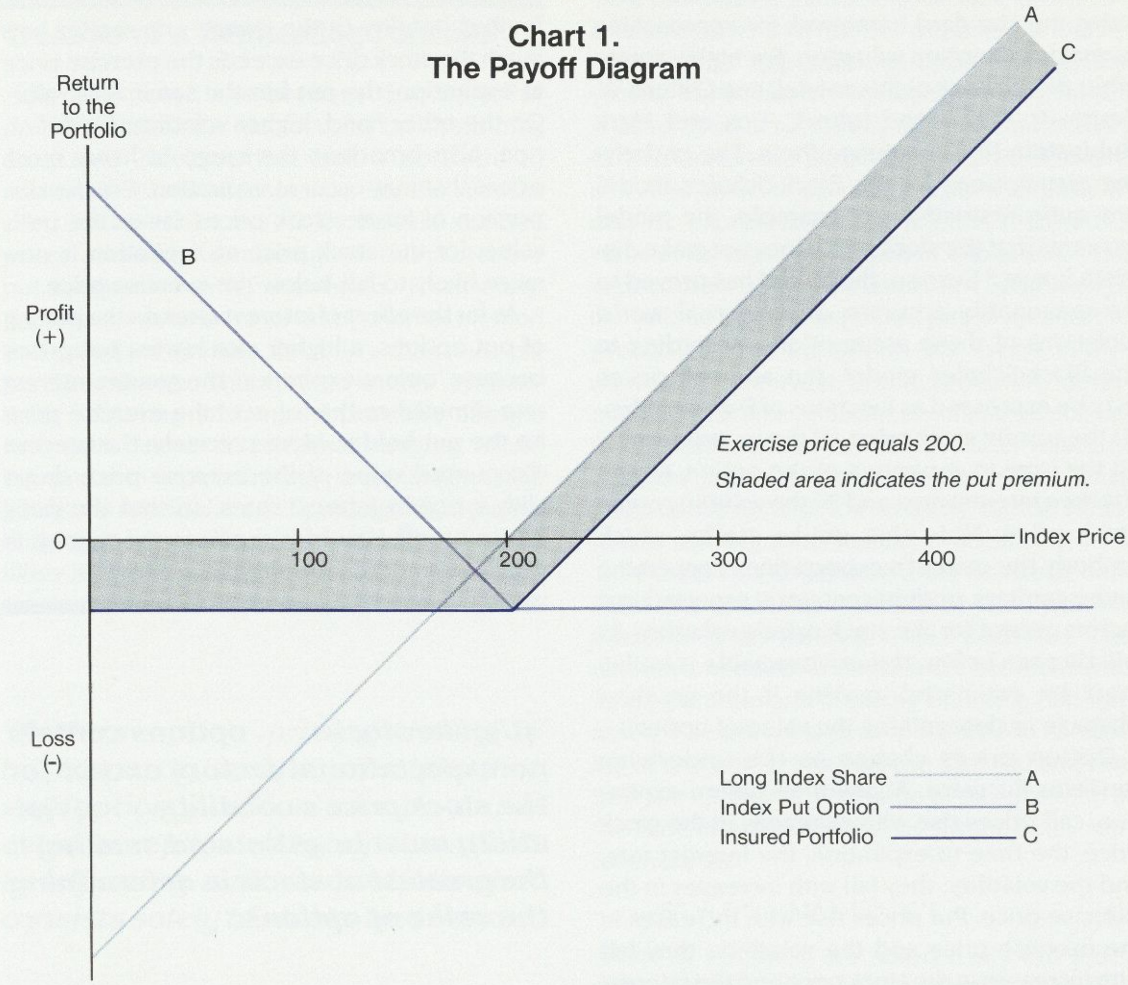
The use of index puts in conjunction with an index portfolio is one means of creating an insured portfolio, but it has several limitations. Exchange-traded index options have a maximum maturity of nine months and are offered only for a limited number of exercise prices. Furthermore, such options may be exercised not only upon expiration, but at any time after purchase. This last feature of a so-called American option is not needed for the type of portfolio insurance generally practiced; the extra flexibility it offers to the option holder adds to the cost of the option. For these reasons, the portfolio insurance strategies considered below will involve the creation of European put options, which may be exercised only at expiration.

The Put Option as Insurance

As mentioned above, the combination of a long index put option with a unit of the S&P 500 index creates one type of portfolio insurance. For a better intuitive understanding of this relationship, the widely used payoff diagram may be helpful (see Chart 1). The diagram illustrates the range of returns available to an insured portfolio. Its horizontal axis indicates the index price at expiration of the put, and the vertical axis shows the return to the portfolio. A long position in the index is represented by line A, which intersects the horizontal axis at 200, the price at which the index was originally purchased. At expiration, every dollar rise above this purchase price corresponds to a dollar in capital appreciation by the portfolio; conversely, every dollar drop below 200 represents capital losses. Line A therefore reflects the returns to the uninsured S&P 500 portfolio. Line B depicts the returns to an index put option whose exercise price is 200. If the index price climbs to 200 or higher, the put expires unexercised, worthless. The option is said to have expired "at-the-money" (final index price equals the exercise price) or "out-of-the-money" (final index price exceeds the exercise price). The constant negative return represents the cost of the put, the put premium, which is the maximum loss that can be realized from a long put. On the other hand, if the index price is below 200, the put ends "in-the-money" and its return rises dollar for dollar with the drop in the index price.

By summing vertically the returns to the long index (line A) and long index put (line B) positions, the payoff line for the insured portfolio, line C, is derived. The maximum loss below 200 is limited to the put premium, while above 200 the portfolio rises dollar for dollar with a rise in the index price. Notice, however, that the return to the insured portfolio for index prices above 200 is shifted downward by the amount of the put premium—the cost of portfolio insurance. The "upside capture" on the insured portfolio is less than 100 percent of the return on its uninsured counterpart due to the initial investment in the index put.

In view of this cost, portfolio insurance should be seen as a way of trading off upside potential for downside protection. Electing to insure a portfolio therefore alters its return distribution. The decision to buy insurance depends on the portfolio's objectives. As reason would suggest, funds geared toward investors who are more risk-averse than average would choose insurance.[3] Besides the very serious practical questions about the effectiveness of these insurance strategies during turbulent markets, there is



some controversy about whether simpler, traditional strategies are more cost-effective. This issue is complex and unresolved, and is beyond the scope of this article.

The index put option in Chart 1 was chosen to be "at-the-money"; that is, its exercise price equals the purchase price of the index portfolio. The insured portfolio finishes with a loss at expiration when the index itself ends unchanged from its initial value, as the cost of the put option must be subtracted. By choosing an index put option whose exercise price exceeds the purchase price of the index portfolio, the investor trades off greater downside protection—a higher floor for the portfolio return—against smaller potential upside returns. This approach accords with the insurance analogy since choosing a higher exercise price is like reducing the size of the insurance deductible, thus increasing the insurance and raising its cost. Similarly, reducing the exercise price raises the deductible and lowers the cost of insurance.

Factors Affecting the Cost of Insurance

The exercise price is but one of several determinants of the insurance cost. For the purposes of this analysis, there are two general kinds of factors that influence the cost of portfolio insurance: (1) those bearing on the value of put options and (2) those arising from the implementation of the insurance, namely, transactions costs. Option valuation factors are discussed here and the second category is deferred until later.

The Black-Scholes option pricing model provides the standard framework for approaching questions of option valuation. For highly accessible discussions of this model, see Clifford W. Smith, Jr. (1977) and John C. Cox and Mark Rubinstein (1985), among others. The underlying assumptions for the Black-Scholes model are quite restrictive; for example, the model assumes that the stock price does not make discrete jumps.[4] Even so, the model has proved to be reasonably accurate despite real world violations of those assumptions. According to the Black-Scholes model, put and call prices may be expressed as functions of five variables: (1) the current stock price, (2) the exercise price, (3) the time to expiration of the option, (4) the risk-free interest rate, and (5) the volatility of the stock price. Note that unlike stocks, which embody the market's expectations concerning future earnings, options contain no expectational factors except for the stock price's volatility. As will be seen below, this unobservable volatility must be estimated, making it the greatest obstacle in determining the value of options.

Option prices change as the underlying variables fluctuate. At any time before expiration, call prices rise with increases in the stock price, the time to expiration, the interest rate, and the volatility; they fall with increases in the exercise price. Put prices rise with increases in the exercise price and the volatility; they fall with increases in the stock price and the interest rate. A lengthening of the time to expiration has an ambiguous impact on put prices. In evaluating these effects, it is assumed that when a change in any particular variable is considered, all other variables remain constant.

An intuitive understanding of the relationships noted above facilitates discussion of option pricing and portfolio insurance. A higher stock price before the option expires reduces the put price because it lowers the probability that the put will end in-the-money. Assuming all other variables—including the volatility and the current stock price—remain unchanged, a higher exercise price increases the likelihood that the put will expire in-the-money. This greater probability raises the put price. A higher stock price volatility also increases the put price. On the one hand, given a fixed current stock price, greater dispersion of future stock prices cannot drive the put price any lower than zero. This is so because put prices, like stock prices, have limited liability to the owner: no matter how much the stock price exceeds the exercise price at expiration, the put has the same zero value. On the other hand, higher volatility, by definition, also broadens the range of lower stock prices that may occur at expiration. Greater dispersion of future stock prices raises the put's value, for the stock price at expiration is now more likely to fall below the exercise price.

As for the effect of interest rates on the pricing of put options, a higher rate lowers put prices because, before expiration, the greater interest rate diminishes the value of the exercise price for the put holder. More precisely, the present discounted value of the exercise price drops with a rise in interest rates, so that the put's future payoff, should it expire in-the-money, is worth less at the current time.

"[U]nlike stocks . . . options contain no expectational factors except for the stock price's volatility. . . . [V]olatility must be estimated, making it the greatest obstacle in determining the value of options."

Lengthening the time to expiration has an ambiguous effect on put prices. An increase in the time to expiration reduces put prices if the ratio of the stock price to the exercise price is small. In other words, the more in-the-money the put is, the less value the prospective receipt of the exercise price will have since the payment is further out in the future. This price-reducing effect may be dominated by a second effect, however. The longer the time to expiration, the greater will be the variability of the stock price over the life of the option, which, everything else being constant, boosts the probability that the put will expire in-the-money. For a sufficiently high ratio of stock price to exercise price, this second effect will overwhelm the first, so that lengthening the time to expiration raises put prices.

Creation of a Replicating Portfolio

To this point, the present discussion of portfolio insurance has focused on combining an actual index option with a portfolio to achieve the desired insurance. For the reasons cited earlier—short maturities, limited exercise prices, and early exercise rights—this protective put approach has its drawbacks. Fortunately, the same end can be reached by another method that provides greater flexibility than outright purchase of a put. This method entails "synthetically" creating an insured portfolio using a technique known as dynamic hedging. While the protective put strategy is generally quite familiar to financial market participants, dynamic hedging is less well understood and thus more likely to evoke an aura of mystery.

"Modern option pricing theory is based partly on the principle that any option position can be duplicated or replicated by systematically adjusting another portfolio that consists solely of stocks and bonds."

In a sense, the techniques of portfolio insurance are a by-product of theoretical advances in option pricing. Modern option pricing theory is based partly on the principle that any option position can be duplicated or replicated by systematically adjusting another portfolio that consists solely of stocks and bonds. The original Black-Scholes equation for the price of a European call option was derived in this way in their 1973 article. Only much later were the principles used in a practical implementation, notably by Mark Rubinstein and Hayne E. Leland (1981), which led to the development and widespread institutional use of portfolio insurance. To understand what synthetically created options are, one must first review some theoretical details, which again are discussed with emphasis on the underlying intuition.

As mentioned earlier, options are derivative assets, and so they do not depend on market participants' expectations concerning future values. Furthermore, the Black-Scholes model is developed in such a way that it is unnecessary to consider market participants' attitudes toward risk. The value of an option before expiration may be expressed as the present discounted value of its expected payoff at expiration.[5] The expectation is a mathematical, not a psychological, one, so that the expected payoff reflects the probability that the option will expire in-the-money. The relevant probabilities are determined by the five variables enumerated above: the current stock price, interest rate, volatility, exercise price, and time to expiration. Thus, given an estimate of the volatility, option valuation is entirely a mechanical process.

To make this discussion more concrete, consider the following example of the synthetic creation of an insured index portfolio. The elements needed for this task are the uninsured index portfolio and Treasury bills (the risk-free asset). The object is to form a portfolio consisting of one unit or share of the S&P 500 and one S&P 500 index put. The value of this portfolio at the time of expiration can be symbolically represented as:

$$S^* + P^* = \text{MAX}\,[S^*, K^*], \tag{1}$$

where S, P, and K are respectively the index price, the put price, and the exercise price. The asterisks denote the value of these variables at the time of expiration. Omission of the asterisks indicates that these variables take on their current values. This equation simply states that the insured portfolio will be worth the greater of S^* or K^*. That is, if S^* exceeds K^*, the put expires worthless and the portfolio value is S^*; otherwise the put expires in-the-money, offsetting the decline in S^* below K^*, and the portfolio value is K^*.

Things are much more complicated prior to expiration. The formula for the *current* insured portfolio value is:

$$S + P = DF \cdot E\,(S^* + P^*), \tag{2}$$

where DF represents a discount factor, which converts the future expected value of the insured portfolio into a current value, and E symbolizes the current expected value of the insured portfolio at the expiration date. DF depends on the interest rate and the time to expiration. The expectation denoted by E may be thought of as an averaging of all the values that the insured portfolio can have at the time of expiration. Some values have higher probabilities than others and thus have greater weight in the computed average. Again, it bears emphasizing that the probabilities depend only on the current values of the five underlying "inputs" into the option pricing equation. In other words, the range of possible insured portfolio values is constrained by these input variables.

Thanks to Black and Scholes's ingenuity, equation (2) can be written in terms of the five underlying variables:[6]

$$S + P = S \cdot N_1 + K \cdot DF \cdot N_2 . \quad (3)$$

Only currently observed variables and the volatility appear in the equation, which is expressed in a simplified notation to emphasize the key variables. The protective put (long index share/long index put) on the left-hand side of the equation has the same value as the replicating portfolio of the index and Treasury bills on the right-hand side. $S \cdot N_1$ represents the dollar amount of the index held and $K \cdot DF \cdot N_2$ the dollar amount of T-bills. Adjustments to the composition of the index/T-bill portfolio over time are made so that the value of the replicating portfolio matches the value of the protective put. This adjustment process is referred to as dynamic hedging, which contrasts with traditional static hedging strategies such as taking a fixed position in short futures or holding a fixed proportion of a portfolio in bonds or bills.

$K \cdot DF$ is the present discounted value of the exercise price. It has an alternative interpretation as the floor for the value of an insured portfolio any time before expiration; K is the floor at expiration.[7] Any desired index put on the left-hand side can be created by an appropriate choice of the exercise price K. The first term on the right-hand side, $S \cdot N_1$, represents the present discounted expected value of the index S* at the expiration date, given that S* exceeds the exercise price K, that is, the put expires out-of-the-money. This so-called conditional expectation is a weighted average of all possible future values of the index that are greater than K. Analogously, the second term on the right-hand side, $K \cdot DF \cdot N_2$, is the present discounted value of K, given that S* turns out to be less than or equal to K, that is, the put finishes in-the-money.

A more immediate sense of how the replicating portfolio mimics a protective put can be developed through a consideration of extreme values that N_1 and N_2 can take. The variables N_1 and N_2 are complicated functions of the five underlying variables; they embody terms for conditional expectations and probabilities. As N_1 approaches zero, N_2 approaches one, and vice versa. Technically, these variables are known as cumulative normal distribution functions, which take values that range from zero to one. As the underlying variables change—for example, as the stock price or its volatility changes—the values of N_1 and N_2 vary, resulting in shifts in the composition of the replicating portfolio that maintain its equality with the protective put. If

"Adjustments to the composition of the index/T-bill portfolio over time are made so that the value of the replicating portfolio matches the value of the protective put. This adjustment process is referred to as dynamic hedging."

the current index price S is very much greater than K, the put is likely to expire out-of-the-money (worthless), and so N_1 is approximately equal to one and N_2 approximately zero. Hence, the current values of the insured portfolio and the index are close. Conversely, if the current index price is very much less than K, the put is "deep" in-the-money and the current insured portfolio value is close to $K \cdot DF$.

The value of N_1 plays a pivotal role in portfolio insurance. It will henceforth be referred to as the option delta, which is the standard name given to this variable. As the index price rises, so does delta; the probability that the synthetic put will expire out-of-the-money increases. The option delta has another important interpretation: it indicates what fraction of the index to hold in the replicating portfolio. Similarly, N_2

indicates the fraction of the maximum current investment in Treasury bills, that is, K•DF. Thus, as delta increases and the index rises, the replicating portfolio is shifted out of Treasury bills and into the index by selling bills and using the proceeds to buy the index. Conversely, as delta decreases and the index falls, the replicating portfolio is shifted the other way by selling the index and using the proceeds to buy bills. At expiration, the portfolio is invested entirely in the index or entirely in T-bills.

Although the composition of the replicating portfolio changes over time as the five underlying variables fluctuate, its current value equals the current value of a long index/long put portfolio because both offer the same payoff at the expiration date. It is in this respect that the replicating portfolio is equivalent to the protective put. The two portfolios are exactly equivalent only if the replicating portfolio is adjusted continuously over time. The continuously-adjusted replicating portfolio is said to be self-financing because once the initial investment is made, no further cash flows come from outside the portfolio. The protective put is also obviously self-financing in that, after the initial purchase of the index share and the index put, no further cash flows arise until the expiration date. The complications that occur due to *discontinuously adjusted* replicating portfolios are discussed below.

"For the futures version, the portfolio holds the entire share of the index and has an appropriate number of short futures contracts in order to create the . . . synthetic bill position."

For the insured portfolio, part of the initial investment goes toward the purchase of a put, necessarily reducing the portfolio's upside potential. The upside capture for the replicating portfolio will be the same as that for an index-put portfolio. The cost is not an actual payment for the put, but the opportunity cost of holding part of the portfolio in Treasury bills. The greater the level of the floor, the higher are the exercise price and put premium and the smaller is the upside capture.

Using Index Futures. Although theoretically feasible, index/T-bill replicating portfolios are not used in practice. Instead, most insured portfolios are implemented using S&P 500 index futures contracts. The transactions costs for using the latter are about one-third less than for Treasury bills. Furthermore, the futures market is more liquid than the stock market, as order executions to buy or sell futures are transacted faster than those for the underlying S&P 500 itself.

The key to understanding the futures implementation is to see that a portfolio combining one share of the index with a short future is theoretically equivalent to holding a Treasury bill. In fact, a short future/long index portfolio is sometimes referred to as a synthetic money market instrument. This equivalence is based on what is known as a cost-of-carry model for futures. Buying an index share and simultaneously selling a futures contract short creates a hedged, (nearly) riskless portfolio because the futures contract fixes the selling price. What should the rate of return on a riskless asset be? By arbitrage, any assets of equal risk and maturity should earn the same rate of return. Thus, the hedged index portfolio should earn the T-bill rate. Further details about creating synthetic money market instruments are presented in the appendix to this article.

Using futures instead of T-bills simply involves an additional step in setting up and adjusting a replicating portfolio. The initial index/T-bill portfolio contains some proportion of bills, based on equation (3). For the futures version, the portfolio holds the entire share of the index and has an appropriate number of short futures contracts in order to create the bill position. In the event that the index rises after the portfolio is established, the short futures position is reduced by buying futures contracts, resulting in a smaller synthetic bill position. On the other hand, a falling index induces more futures sales to lessen the portfolio's exposure to the market, thus placing more of the portfolio in synthetic bills.

Practical Considerations

This section develops in greater depth the background needed to understand the index/T-bill and index/futures implementations of portfolio insurance. Before examining simulations run on actual historical data, some additional preliminary topics are discussed. These are intended to give a more detailed view of the mechanics of running an insured portfolio and to help in interpreting the simulation results. These topics will also help to illuminate the channels through which portfolio insurance may have affected the underlying stock market, particularly during the October 19 crash.

Sources of Error and Risk in Portfolio Replication. In practice, the floor provided by portfolio insurance can be rather soft. Inaccuracies in protective put replication arise from a number of sources. Nonconformity of real-world stock and stock-index price movements with those assumed in an option pricing model, as well as the possible inadequacy of the model itself, presents a source of error and risk to the insured portfolio owner.

The adaptation of theory to practice gives rise to replication errors, the differences between the values of the actual replicating portfolio and the theoretical insured portfolio (that is, long index/long put). Discontinuous adjustment to the composition of the insured portfolio necessarily produces replication errors, both gains and losses, which add to the uncertainty about insured portfolio performance. This adjustment process is referred to as rebalancing the portfolio. There are many possible rebalancing criteria that offer different trade-offs between more accurate replication of a long index/long put portfolio and the transactions costs that accrue due to rebalancing. According to the Black-Scholes model, one necessary condition for perfect replication is that rebalancing must occur *continuously* over time; however, even if this were possible, transactions costs would render such rebalancing prohibitively expensive. Thus, actual replicating portfolios will not match their theoretical potentials. For the purpose of this exposition, the simulated insured portfolios were rebalanced daily.

Replication errors are particularly serious when stock prices "jump" to a new level. During such sharp market moves, there is no opportunity to rebalance the insured portfolio. Due to the trade-offs involved in managing an insured portfolio, achieving a firm floor is difficult in practice. This obstacle poses a serious risk to the holder of an insured portfolio.

Mentioned above were the problems associated with estimating volatility.[8] Furthermore, the volatility may change over time, adding to uncertainty about the cost of portfolio insurance. The volatility estimate is usually revised whenever the insured portfolio is rebalanced.

For portfolios whose composition is not identical to the index, there also exists a basis risk. This risk refers to the less than perfect positive correlation between movements in the values of the portfolio and (discounted) long futures. Even for exact index portfolios, a basis risk is

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still present if the put option expiration date does not coincide with the futures expiration. Nonsynchronous expiration dates also gives rise to an interest rate risk. The S&P 500 index futures contracts can be readily traded only in contract maturities of no longer than four months. Furthermore, these short-maturity contracts, being more liquid, are traded with lower transactions costs. Portfolio insurance programs, however, typically run from one to five years. Hence, the futures position must be "rolled over" at relatively frequent intervals. The difference in the expiration dates for the PI program and futures contracts creates a mismatch between the interest rate appropriate for the replicating portfolio and the short-term interest rate implied by the futures position. Thus, using futures generally entails both basis risk and interest rate risk.

The simulation runs discussed below are intended as an illustration of portfolio insurance, not as an evaluation of its efficacy. A more sophisticated modeling effort would be needed to capture many of the subtleties involved in running real-world insured portfolios.[9] Actual portfolio insurance providers do not simply let their programs run on automatic. Instead, much judgment comes into play, particularly in estimating the unobservable option volatility. Judgment is likewise instrumental when an insurer wishes to profit from futures mispricing and timing of rollovers, to decide on the timing and criteria for rebalancing, and, for some insurers, to switch among different methods for creating the insurance. These complications make actual implementation of portfolio insurance as much an art as a science.

"Actual portfolio insurance providers do not simply let their programs run on automatic. Instead, much judgment comes into play. . . . These complications make actual implementation of portfolio insurance as much an art as a science."

Some Refinements. To simplify the exposition thus far, it has been assumed that the index does not pay dividends. Because the simulations presented below use actual index data, the option pricing model needs to account for dividend payments. The insured portfolios to be examined will create European, payout-unprotected puts, that is, puts that protect only the capital appreciation component of the index return, not the dividend component. To value a dividend-unprotected put, it was assumed that the future dividend payments and their timing are known with certainty. Each index price was adjusted by subtracting the present discounted value of all future dividend payments remaining between the current date and the expiration date. In theory, stock prices fall by the amount of the dividend payment on their ex-dividend dates; the same is true of the index, which experiences dividend distributions almost daily from its constituent stocks. The dividend-adjusted index was used in the Black-Scholes option formula to evaluate the value of delta. Both insured and uninsured index portfolios receive dividends, which are reinvested in T-bills. Bear in mind that variations in the dividend flow from the index account for only a minor proportion of the variations in the total returns on the insured and uninsured portfolios.

The simulations reported below compare insured with uninsured index portfolios. In order to make the two comparable, both were constructed to start with the same initial investment, which was the current index value for each simulation period. (Establishing an insured portfolio of the index and T-bills, or the index with short futures, is conceptually equivalent to allocating part of the funds toward paying the put premium and the remainder toward buying the index). Details concerning the method of equating the initial values of both portfolios are discussed in Mark Rubinstein (1984) and in F.J. Gould and C.B. Garcia (1987). All portfolios used daily closing prices for the S&P 500 index and futures. Unless otherwise noted, daily interest rates were computed from the outstanding T-bill that matured immediately after the S&P 500 futures expired. The expiration dates used in the simulations were taken to be the first trading day during the delivery month for the expiring S&P 500 futures contract. Transactions costs were incorporated in the Black-Scholes model using the Leland (1985) method of augmenting the estimated option volatility. The assumed transactions costs of adjusting the insured portfolio are taken to be 1 percent of the volume of transactions for the index/T-bill version and 0.33 percent for the index/futures. These figures are consistent with those reported in Rubinstein (1984), Ethan S. Etzioni (1986), and Garcia and Gould (1987). The relative cost advantage of futures assumed here is fairly conservative.

Another detail that deserves mention is that the cash flows associated with a futures position are ignored in the simulations. Futures contracts are marked to market daily, which means that gains (or losses) to the futures position are received (or paid) daily. In managing an actual insured portfolio, some provision must be made to handle these cash flows, particularly the out-

Table 1.
An Example of an Index/T-Bill Insured Portfolio, September 3, 1986 - September 16, 1986*

Date	Uninsured Portfolio	Percent Change	Insured Portfolio	Percent Change	Delta	Synthetic Put Price**	Stock	Bills	Interest Rate
9/3	250.08	.00	250.08	.00	.278	11.38	66.60	183.48	5.25
9/4	253.86	1.51	250.90	.33	.377	9.09	91.58	159.53	5.22
9/5	250.54	.18	250.00	-.03	.302	11.44	72.27	177.63	5.28
9/8	248.24	-.73	249.51	-.23	.248	13.08	58.95	190.31	5.28
9/9	247.81	-.91	249.45	-.25	.221	13.12	52.31	196.87	5.27
9/10	247.23	-1.14	249.39	-.28	.204	13.56	48.13	200.96	5.22
9/11	235.38	-5.88	247.50	-1.03	.119	24.94	26.69	220.10	5.28
9/12	230.90	-7.67	247.05	-1.21	.083	29.11	18.42	227.90	5.26
9/15	232.20	-7.15	247.20	-1.15	.092	27.94	20.47	225.99	5.23
9/16	232.02	-7.22	247.22	-1.14	.088	28.13	19.43	227.06	5.20

* *The portfolio is rebalanced daily.*

** *The expiration date for the synthetic put is December 1, 1986.*

flows. Either a separate fund of cash instruments (T-bills) is set aside for this purpose, or part (say, 5 percent) of the insured portfolio is held in T-bills. A somewhat more complicated accounting scheme would have been needed in the simulations to keep track of the interest earned (or forgone) on the gains (or losses) to the futures position. However, including this accounting would have only a minor effect on the simulation results.

Two Examples of Insured Portfolios

The Index/T-Bill Version. Table 1 provides a detailed comparison of the daily changes in sample insured and uninsured S&P 500 index portfolios. The insured portfolio uses the index/T-bill implementation; its transactions costs were set to zero for this example. Both portfolios are initiated on September 3, 1986, and have initial index values of 250.08. The insured portfolio contains a synthetic put that expired on December 1, 1986, and that was constructed to insure to a maximum (theoretical) loss of zero percent of the initial portfolio value. The zero percent floor applies to the insured portfolio value as of the expiration date. Prior to that date, as can be seen, the portfolio can fall below the floor level, although capital losses will be less than those on the uninsured portfolio.

During the ten-trading-day period reported in the table, the S&P 500 fell sharply, experiencing a very large 4.8 percent decline on Thursday, September 11, from the previous day's close. This produced a 42 percent drop in delta, which triggered a 45 percent reduction in the insured portfolio index holdings. The proceeds from the partial index liquidation were used to increase bill holdings. Due to this gradual daily shifting of index holdings to bills, the insured portfolio had lost 1.0 percent of its value from September 3 as compared with a 5.9 percent loss on the uninsured index itself. Another way to view this process is to note that the synthetic put value rose over this period as the index fell, thus providing partial insurance during the market's decline.

Over the full insurance period, the actual index turned out to be almost unchanged, finishing on December 1 at 249.05. The uninsured portfolio (which includes accumulated dividends and interest) was up 0.41 percent, while the insured portfolio was down 0.60 percent. As expected, the insured portfolio was less volatile than the index: the maximum loss for the uninsured portfolio was 7.8 percent as opposed to a

Table 2.
An Example of an Index/Futures Insured Portfolio, September 3, 1986 - September 16, 1986*

Date	Uninsured Portfolio	Percent Change	Insured Portfolio	Percent Change	Delta	Synthetic Put Price**	Stock	Bills	Synthetic Interest Rate	Futures Basis
9/3	250.08	.00	250.08	.00	.278	11.38	66.60	183.48	8.54	2.27
9/4	253.86	1.51	251.17	.44	.377	9.09	91.58	159.68	8.10	2.07
9/5	250.54	.18	250.83	.30	.302	11.44	72.27	178.46	5.71	.98
9/8	248.24	-.73	249.25	-.33	.248	13.08	58.95	190.18	8.93	2.31
9/9	247.81	-.91	249.46	-.25	.221	13.12	52.31	197.02	8.12	1.93
9/10	247.23	-1.14	249.63	-.18	.204	13.56	48.13	201.35	7.37	1.59
9/11	235.38	-5.88	249.07	-.40	.119	24.94	26.69	220.02	2.68	-.28
9/12	230.90	-7.67	249.25	-.33	.083	29.11	18.42	230.47	0.74	-.97
9/15	232.20	-7.15	249.19	-.35	.092	27.94	20.47	228.36	1.21	-.79
9/16	232.02	-7.22	249.28	-.32	.088	28.13	19.43	229.48	0.94	-.87

* *The portfolio is rebalanced daily.*

** *The expiration date for the synthetic put is December 1, 1986.*

maximum loss of 1.5 percent for the insured; the maximum gains were 1.5 percent and 0.3 percent, respectively. Again, downside protection comes at the expense of upside performance.

The Index/Futures Version. Table 2 repeats the portfolio comparisons given in Table 1, but instead of index/bill implementation the insured portfolio uses index/futures. The synthetic put prices and option deltas are identical to those in Table 1, because the T-bill rate was still used in the Black-Scholes equation. Transactions costs are again assumed to be zero for this example. Differences between the two simulations arise because of mispricing of the futures. Both Etzioni (1986) and John J. Merrick, Jr. (1987b) discuss the empirically observed tendency for index futures price changes to "overshoot" index price changes. In other words, when the index price is rising (falling), the futures price tends to increase (decrease) more than proportionately. As a result of mispricing, the value of the synthetic bill position on a given day will differ from the value of the T-bill position on that day. The reported daily interest rates on the synthetic bill are clearly more volatile than the corresponding T-bill rates. This is true not only for this small sample but also over the entire history of the S&P 500 index futures. The volatility tends to be greatest during the contract's delivery month, which is why the expiration date for the insurance period was chosen to be the first trading day of the delivery month.

Underpriced futures contracts imply that bill yields are lower and bill prices are higher. Additional futures sales during a market decline are therefore equivalent to purchasing low (and possibly negative) yielding synthetic bills. During the market drop on September 11, the synthetic rate dropped from 7.37 percent the previous day to 2.68 percent, and continued to fall on the next day to 0.74 percent. As can be seen in the "Futures Basis" column, the decline in yield corresponds to a dipping of the S&P December futures price below the S&P 500 index (that is, a negative basis). This occurrence is not uncommon, despite the fact that it represents a stock-index arbitrage opportunity.[10]

The value of the synthetic bill component of the insured portfolio on September 11 exceeded the value of the corresponding actual bill component reported in Table 1. This disparity appears simply because the synthetic bills bought before September 11 were cheaper than the actual T-bills; that is, the synthetic yield was greater than the actual bill yield. After September 11, the pricing relationship reversed so that if the insured portfolio had been liquidated at the close of business on September 11, capital gains would have accrued to the synthetic bills. The superior performance of the index/futures portfolio over the index/T-bill portfolio resulted because futures were initially overpriced and later underpriced during the first half of September 1986. From September 3 to the close on September 11, the index/futures insured portfolio was down only 0.40 percent as compared with a decline of 1.03 percent for the index/T-bill portfolio.

During the course of the insurance period, it turned out that the synthetic rate was more often than not below the actual bill rate. The cumulative impact of the futures mispricing caused the index/futures insured portfolio to finish below the index/T-bill insured portfolio. At expiration on December 1, 1986, the index/T-bill insured portfolio was 0.60 percent below its initial value, while the index/futures insured portfolio was down 1.06 percent. Discontinuous trading results in cumulative errors in the replicating portfolio, so that, as in these cases, the portfolio performances will virtually always deviate from their theoretical potentials.

Simulations Using Historical Data

Tables 3 through 5 report simulation results for insured and uninsured S&P 500 index portfolios spanning different periods and using different implementations and insurance floors. Table 3 displays the results for portfolio simulations that ran one-year insured portfolios with starting dates from January 1974 to January 1986. The daily yield on the current one-year T-bill was used in the daily option pricing. Most portfolios were simulated over 253 trading days, and the insured portfolios, with - 5, 0, and 3 percent floors, were rebalanced daily. Most items in the table are self-evident. For any time period, the uninsured S&P 500 index and insured portfolio data and statistics are read by row. The final S&P 500 index value is less than the S&P portfolio value (the "Final Portfolio" column) because the latter includes accumulated dividends and interest on those dividends. The uninsured S&P portfolio is directly comparable with the various insured portfolios.

All percentage changes are taken relative to the initial portfolio values, which by construction are the same for all portfolios. The "Portfolio Percent Change" column gives the total change from the initial to final dates. The "Maximum Percent Change" column gives the maximum cumulative change in portfolio that occurred during the life of the portfolio. Similarly, the "Minimum Percent Change" column indicates the lowest cumulative percentage change from the initial portfolio value.

Finally, the "Cost" column reports the difference between a given insured portfolio's final return (under "Portfolio Percent Change") and the uninsured portfolio's final return (in the same column). Again, the cost can be thought of as being analogous to funds allocated to purchasing a put, so that less remains for investment in the index. The cost actually arises because part of an insured portfolio's value is placed in T-bills, which necessarily results in forgone capital and dividend returns when the uninsured portfolio appreciates faster than T-bills. The cost, therefore, is actually an opportunity cost associated with creating an insured portfolio. On the other hand, when the insured portfolio loses value relative to the floor level, the cost of holding an insured portfolio will be negative, that is, the insurance pays off.

As an example of insured and uninsured portfolio performance during a rising market, consider the January 2, 1986, to December 31, 1986, holding period in Table 3. All portfolios started at the initial index value of 209.59. The uninsured portfolio appreciated by 19.65 percent by December 31, whereas all insured portfolios underperformed this rate of appreciation, as expected. The - 5 percent floor portfolio had, in effect, the largest deductible and consequently had the next best return of 12.67 percent, 6.99 percentage points less than the uninsured portfolio's cumulative change. Reducing the deductible, by lifting the floor, raised the opportunity cost of insurance considerably. The cumulative returns on the 0 percent and 3 percent floor portfolios were, respectively, 9.39 and 5.08 percent. The synthetic creation of a protective put also dampened fluctuations in insured portfolio values over the lives of the portfolios, as is readily seen in the maximum and minimum cumulative percentage change columns.

The January 3, 1977, to December 30, 1977, period gives an example of portfolio performance during a declining market. Because the

Table 3.
Insured vs. Uninsured Index Portfolios*
(Transactions Costs Included)

Index/T-Bill Version

Portfolio	Floor Level	Initial Index	Final Index	Final Portfolio	Portfolio Percent Change	Maximum Percent Change	Minimum Percent Change	Cost
			January 3, 1974 - December 31, 1974 253 Trading Days					
S&P 500	***	97.68	68.56	72.39	-25.90	2.83	-33.32	***
-5%	92.80	***	***	94.45	-3.31	1.13	-5.44	-22.60
0%	97.68	***	***	99.79	2.16	2.16	-1.64	-28.06
+3%	100.61	***	***	101.84	4.26	4.26	-0.81	-30.16
			January 2, 1975 - December 31, 1975 253 Trading Days					
S&P 500	***	70.23	90.19	94.08	33.93	39.04	-0.19	***
-5%	66.72	***	***	84.99	21.02	28.25	-0.15	12.91
0%	70.23	***	***	80.59	14.74	21.83	-0.08	19.20
+3%	72.35	***	***	76.00	8.21	13.97	-0.01	25.72
			January 2, 1976 - December 31, 1976 253 Trading Days					
S&P 500	***	90.90	107.46	111.51	22.65	22.65	1.86	***
-5%	86.36	***	***	104.77	15.26	15.65	1.32	7.39
0%	90.90	***	***	101.73	11.91	12.24	0.88	10.74
+3%	93.63	***	***	97.30	7.04	7.20	0.46	15.62
			January 3, 1977 - December 30, 1977 252 Trading Days					
S&P 500	***	107.00	95.10	99.83	-6.72	-1.20	-11.59	***
-5%	101.65	***	***	100.80	-5.80	-0.89	-6.42	-0.92
0%	107.00	***	***	106.94	-0.06	-0.06	-2.29	-6.66
+3%	110.21	***	***	110.16	2.96	2.96	-0.46	-9.67
			January 3, 1978 - December 29, 1978 252 Trading Days					
S&P 500	***	93.82	96.11	101.43	8.09	17.91	-6.47	***
-5%	89.13	***	***	95.11	1.37	12.93	-4.73	6.71
0%	93.82	***	***	93.31	-0.55	10.49	-2.60	8.64
+3%	96.64	***	***	95.03	1.28	6.92	-1.07	6.80
			January 2, 1979 - December 31, 1979 253 Trading Days					
S&P 500	***	96.73	107.94	113.91	17.74	19.63	0.25	***
-5%	91.89	***	***	106.93	10.54	13.87	-0.58	7.20
0%	96.73	***	***	105.66	9.24	12.35	-0.14	8.51
+3%	99.63	***	***	103.75	7.26	10.10	0.35	10.48
			January 2, 1980 - December 31, 1980 253 Trading Days					
S&P 500	***	105.76	135.76	142.42	34.63	38.54	-5.73	***
-5%	100.47	***	***	134.19	26.88	31.32	-5.53	7.75
0%	105.76	***	***	132.10	24.90	29.26	-4.79	9.73
+3%	108.93	***	***	129.59	22.53	26.80	-4.18	12.10

Table 3 continued

Portfolio	Floor Level	Initial Index	Final Index	Final Portfolio	Portfolio Percent Change	Maximum Percent Change	Minimum Percent Change	Cost
			January 2, 1981 - December 31, 1981 253 Trading Days					
S&P 500	***	136.34	122.55	129.71	-4.88	1.66	-13.53	***
-5%	129.52	***	***	128.67	-5.63	1.02	-8.39	0.75
0%	136.34	***	***	136.95	0.45	0.85	-3.58	-5.32
+3%	140.43	***	***	141.91	4.08	4.08	-2.58	-8.96
			January 4, 1982 - December 31, 1982 253 Trading Days					
S&P 500	***	122.74	150.64	148.06	20.60	21.87	-12.93	***
-5%	116.60	***	***	138.92	13.18	15.08	-9.09	7.42
0%	122.74	***	***	138.26	12.64	14.45	-6.41	7.96
+3%	126.42	***	***	137.05	11.66	13.42	-4.79	8.95
			January 3, 1983 - December 30, 1983 253 Trading Days					
S&P 500	***	138.34	164.93	172.40	24.59	28.91	1.48	***
-5%	131.42	***	***	159.01	14.94	20.18	0.55	9.65
0%	138.34	***	***	153.75	11.14	16.05	0.43	13.45
+3%	142.49	***	***	148.07	7.03	10.92	0.37	17.56
			January 3, 1984 - December 31, 1984 253 Trading Days					
S&P 500	***	164.04	167.24	175.18	6.77	7.93	-7.28	***
-5%	155.84	***	***	166.25	1.35	3.23	-7.10	5.42
0%	164.04	***	***	166.08	1.25	2.91	-4.39	5.52
+3%	168.96	***	***	166.21	1.32	2.88	-2.38	5.45
			January 2, 1985 - December 31, 1985 253 Trading Days					
S&P 500	***	165.37	211.28	219.67	32.81	33.03	-0.99	***
-5%	157.10	***	***	207.71	25.60	26.04	-0.74	7.21
0%	165.37	***	***	203.62	23.13	23.55	-0.52	9.28
+3%	170.33	***	***	198.39	19.97	20.37	-0.32	12.85
			January 2, 1986 - December 31, 1986 253 Trading Days					
S&P 500	***	209.59	242.17	250.82	19.65	24.95	-2.70	***
-5%	100.11	***	***	236.14	12.67	18.18	-2.05	6.99
0%	209.59	***	***	229.28	9.39	14.74	-1.39	10.26
+3%	215.88	***	***	220.23	5.08	10.60	-0.76	14.58

* *The portfolios are rebalanced daily.*

uninsured portfolio ended 6.72 percent below its initial value, all synthetic puts finished in-the-money. The - 5, 0, and 3 percent floor portfolios had cumulative final returns of - 5.80, - 0.06, and 2.96 percent respectively. These returns happen to be quite close to their floor values. Due to replication errors, returns for these portfolios during other down-market years are sometimes greater or smaller than their targeted floors. Notice that even before the insured portfolios' expiration dates, some degree of protection was obtained from market declines, since the minimum cumulative percentage changes are not as large as the -11.59 percent drop for the uninsured portfolio.

Tables 4 and 5 give simulation results for three-month insurance periods (see pp. 20-23). The two tables are identical in all respects, except that Table 4 represents the index/T-bill version of portfolio insurance while Table 5 represents the index/futures version. Each insurance period coincides with the final three months for each of the S&P 500 index futures contracts issued, beginning with the March 1983 contract. The T-bill expiring immediately after the futures contract was matched with the futures in doing each simulation, and the daily yield on that bill was used in pricing the option in both tables. The tables include insured portfolios with 0 and - 5 percent floors. The full simulation results for Tables 1 and 2 are given in the last block of entries in Tables 4 and 5.

In the sample considered in Tables 4 and 5, futures mispricing turns out to be substantial. In 14 out of 36 simulated insured portfolios, the cost of the index/futures version exceeded that of the index/T-bill version, despite the transactions cost advantage of using futures. These simulations were also recomputed setting transactions costs to zero, as in Tables 1 and 2. Differences between the two implementations now arise solely because of mispricing.[11] The results (not included in the tables) indicate that 18 out of 36 index/futures simulations are higher-cost compared with their index/T-bill counterparts. The simulations reveal that index futures mispricing is empirically important and can offset the cost advantage of using futures. This conclusion is tempered by the caveats offered above concerning simulations and by the conservative estimate for the futures cost advantage.

To the extent that the mispricing is systematic and predictable, the replication strategy can be adjusted to compensate for the mispricing. Merrick (1987b) discusses a procedure to correct for predictable mispricings. To some degree, judgment and discretion exercised in insuring a portfolio using futures would be expected to mitigate the costs arising from disadvantageous mispricing.

Insurers particularly want to protect against catastrophic market declines, and this is precisely where the usefulness of portfolio insurance is problematic. The mispricing phenomenon became acute during the October 19, 1987, stock market crash. One prominent portfolio insurer hesitated in selling futures as the market declined because of the steep discount on the futures below the index. The firm hoped for a realignment of futures and index prices, which did not occur due to the breakdown in arbitrage, and eventually sold less than half the futures contracts that their programs called for.[12] Other insurers were probably in a similar bind at the time. As a result, insured portfolios fell below their floor levels. The accompanying box discusses the issues and presents currently available information on the role of portfolio insurance in the October crash (see p. 19).

Conclusion

The term portfolio insurance is a misnomer, as the recent market crash has made abundantly clear. This article has shown how the most common implementation of portfolio insurance is a specialized form of hedging using stock-index futures. As is well known to practitioners, hedging is generally not without risk, and portfolio insurance strategies are no exception.

The dynamic adjustments associated with portfolio insurance distinguish it from other types of hedging. Frequent changes to the short futures position, or alternatively to the index and T-bill positions, are made to replicate synthetically a portfolio insured by an index put (a protective put). The success of this hedging strategy in providing downside protection depends on a host of factors, which have been discussed in this article. Actual insured portfolio performance may fail to achieve the prespecified floor rate of return. One reason, highlighted above, is that futures prices frequently differ substantially from their theoretically predicted values. Futures mispricing contributes to the uncertainty regarding insured portfolio performance and cost.

The mispricing that occurred during the October 19 stock market crash was unprecedented, as were practically all aspects of that financial collapse. As critics were quick to point out, portfolio insurance did not perform as expected. However, the partial failure of the insurance was a consequence of structural frictions in both the stock and futures markets, not of the insurance technique per se. Since the market collapse, the number of clients using portfolio insurance has shrunk, reportedly by half of the pre-October level, in terms of asset values covered.[13] Whether portfolio insurance recovers its appeal remains an open question. What is clear is that major institutional changes that transform trading into a more highly automated process would improve the effectiveness of PI strategies. Over recent years, advances in computer technology have revolutionized trading in traditional as well as in new securities and financial instruments and will surely continue to do so. Portfolio insurance is an outgrowth of progress in financial theory and practice, and is but one example of the evolutionary development of the marketplace.

Appendix

The relationship between the index price and the futures price is determined by the net cost of holding a hedged long position in the S&P 500 index. The opportunity cost of this investment is assumed to be the risk-free rate, that is, the interest rate on Treasury bills of comparable maturity. Selling an S&P 500 futures contract against a share of the S&P 500 index renders the long index position riskless because at expiration, due to the convergence of futures and index prices, the gain (or loss) on the long index position will be exactly offset by the loss (or gain) on the short futures position. In equilibrium, investors will be indifferent between holding a perfectly hedged position in the index and holding an equivalent position in T-bills.

The cost-of-carry relationship may be expressed as follows:

$$\frac{365}{\tau}\left[\left(\frac{F - I}{I}\right) + \frac{D}{I}\right] = r,$$

where F is the current futures price, I the current index price, D the present discounted value of anticipated dividends, r the annualized risk-free rate, and τ the time to expiration of the futures contract. The first term in brackets is the futures basis, expressed as a fraction of the index. The second term is the expected dividend yield. The annualized sum of these two yields is equal to the annualized risk-free rate. In other words, the holder of the hedged index position receives the capital appreciation locked in by the futures contract and the dividends paid by the stocks contained in the index up until expiration of the futures contract.

Given the values of the other variables, the equilibrium value of the futures price is determined. A futures basis greater than the equilibrium basis implies a risk-free arbitrage opportunity which entails selling the relatively overpriced future and buying the underpriced index. Conversely, a futures basis smaller than the equilibrium basis induces arbitrage, which involves buying the underpriced future and selling (or selling short) the overpriced index. See John J. Merrick, Jr. (1987a) for an introduction to stock-index arbitrage, and Hans R. Stoll and Robert E. Whaley (1985) for a discussion of practical aspects of carrying out the arbitrage.

Portfolio Insurance and the Crash of October 1987

The stock market crash on Monday, October 19, 1987, has raised questions both about how effectively portfolio insurance limited downside risk and about its possible systemic repercussions to the underlying stock market. On October 19, "Black Monday," the Dow Jones Industrial Average plunged a record 508 points (22 percent) and the S&P 500 Index dropped 57.6 points (20.5 percent), proportionately almost as much. In the following weeks, both stock-index arbitrage and portfolio insurance were widely blamed for exacerbating the market's turmoil.

Some critics have raised a well-founded concern that the *interaction* of portfolio insurance and stock-index arbitrage may be destabilizing. Stock-index arbitrage should be thought of as a trading link between the futures and stock markets that aligns index futures and stock index prices. Stock-index arbitrage is a straightforward form of arbitrage: buying a good or asset in a market where it is cheap and selling it in a market where it is dear. If the futures price is sufficiently below (above) the index price, arbitrageurs buy (sell) the futures and sell (buy) the index. In theory, ensuring that the "law of one price" holds cannot be destabilizing; in practice, however, the volume and timing of stock-index arbitrage could conceivably contribute to intraday volatility. Coupling index arbitrage with portfolio insurance may create destabilizing price movements. The critics' argument goes as follows: A large market decline triggers futures selling by portfolio insurers, which drives the futures price down relative to the index price. This in turn sets off arbitrage trading because the futures become underpriced relative to the index. Stock-index arbitrageurs buy the futures and sell short a basket of stocks that replicates the current composition of the index. Stock sales by arbitrageurs drive the index price down. Thus, stock-index arbitrage transmits the selling pressure from futures to the stock market. Arbitrage-induced price declines in the stock market then induce further portfolio-insurance futures selling, setting off a downward price spiral between the stock and futures markets.

What actually happened on October 19 is more complicated than the above scenario. Right at the opening of trade on "Black Monday," the S&P 500 futures market was exposed to great selling pressure. After the previous Friday's 106 point decline on the Dow, portfolio managers and others may have anticipated further futures selling by insurers and tried to get their own futures and stock sales in ahead of them.

The chaotic market conditions on Black Monday led to a breakdown of stock-index arbitrage because it became very risky. The volatility in both the futures and stock markets made it difficult to know what the current futures and index prices were. Trades based on incorrect prices could translate into large losses on what theoretically are riskless transactions. The record trading volume of 605 million shares on the New York Stock Exchange (NYSE) also compounded the risk, as orders could not be executed immediately and simultaneously in the two markets. The NYSE "uptick" rule restricted opportunities to sell stock short during the huge market decline on October 19. Arbitrageurs who executed their stock market trades by short selling had to wait for component stock prices to rise before having their sell orders executed. Severe order backlogs developed on the NYSE.

Preliminary survey data collected by the regulatory agency that oversees stock-index futures trading, the Commodity Futures Trading Commission (CFTC), indicate that index arbitrage constituted only 9 percent of total NYSE volume on that day. On the following day, after the Chicago Mercantile Exchange temporarily suspended trading in stock-index futures, the NYSE effectively banned arbitrage by prohibiting brokerage houses from executing orders through direct computer links to the exchange floor; arbitrage trading dropped to 2 percent of volume.[1]

According to preliminary CFTC trader position data, futures selling by institutional investors accounted for a greater volume of trades in the S&P 500 futures than stock-index arbitrage: their futures sales on October 19 represented between 12 and 24 percent of that day's total volume in the S&P 500 contract and between 19 and 26 percent on October 20.[2] Portfolio insurance-related futures sales were a portion of that hedging-related activity. Only careful study of market events surrounding the crash may uncover what role portfolio insurance played in the market turmoil.

Notes

[1] U.S. Commodity Futures Trading Commission, *Interim Report on Stock Index Futures and Cash Market Activity During October 1987*, November 9, 1987, p. 74.

[2] Ibid.

Table 4.
Insured vs. Uninsured Index Portfolios*
(Transactions Costs Included)

Index/T-Bill Version

Portfolio	Floor Level	Initial Index	Final Index	Final Portfolio	Portfolio Percent Change	Maximum Percent Change	Minimum Percent Change	Cost
			January 31, 1983 - March 1, 1983 22 Trading Days					
S&P 500	***	144.51	150.88	151.49	4.83	4.83	-1.03	***
-5%	137.28	***	***	150.16	3.91	3.91	-0.88	0.92
0%	144.51	***	***	145.08	0.39	0.48	-0.15	4.43
			March 3, 1983 - June 1, 1983 64 Trading Days					
S&P 500	***	152.30	162.55	164.36	7.92	10.23	-1.58	***
-5%	144.68	***	***	161.12	5.79	8.14	-1.22	2.13
0%	152.30	***	***	154.28	1.30	2.75	-0.25	6.62
			June 3, 1983 - September 2, 1983 66 Trading Days					
S&P 500	***	163.98	165.00	166.86	1.75	4.54	-2.12	***
-5%	155.78	***	***	164.06	0.05	3.67	-2.85	1.70
0%	163.98	***	***	163.41	-0.35	1.72	-0.92	2.10
			September 7, 1983 - December 1, 1983 62 Trading Days					
S&P 500	***	167.89	166.49	168.25	0.21	3.24	-2.89	***
-5%	159.50	***	***	166.42	-0.88	2.42	-2.95	1.09
0%	167.89	***	***	168.77	0.52	0.99	-0.40	-0.31
			December 5, 1983 - March 1, 1984 62 Trading Days					
S&P 500	***	165.54	158.19	160.01	-3.34	2.68	-5.79	***
-5%	157.26	***	***	157.66	-4.76	2.00	-5.27	1.42
0%	165.54	***	***	166.16	0.37	0.96	-0.58	-3.71
			March 5, 1984 - June 1, 1984 64 Trading Days					
S&P 500	***	159.24	153.24	155.14	-2.57	2.46	-4.48	***
-5%	151.28	***	***	152.94	-3.95	1.38	-4.66	1.38
0%	159.24	***	***	160.05	0.51	0.54	-0.78	-3.08
			June 5, 1984 - September 4, 1984 65 Trading Days					
S&P 500	***	154.34	164.88	166.85	8.11	9.82	-3.53	***
-5%	146.62	***	***	163.87	6.17	8.07	-3.38	1.93
0%	154.34	***	***	158.51	2.70	4.48	-0.93	5.41
			September 6, 1984 - December 3, 1984 63 Trading Days					
S&P 500	***	164.29	162.82	164.73	0.27	4.53	-1.16	***
-5%	156.08	***	***	162.05	-1.36	3.13	-1.44	1.63
0%	164.29	***	***	166.00	1.04	1.38	0.05	-0.77

Table 4 continued

Portfolio	Floor Level	Initial Index	Final Index	Final Portfolio	Portfolio Percent Change	Maximum Percent Change	Minimum Percent Change	Cost
			December 5, 1984 - March 1, 1985 61 Trading Days					
S&P 500	***	163.38	183.23	185.17	13.34	13.34	-0.83	***
-5%	155.21	***	***	182.18	11.51	11.58	-0.77	1.83
0%	163.38	***	***	176.08	7.78	7.83	-0.25	5.56
			March 5, 1985 - June 3, 1985 64 Trading Days					
S&P 500	***	182.06	189.32	191.36	5.11	5.22	-2.88	***
-5%	172.96	***	***	189.37	4.02	4.23	-2.30	1.09
0%	182.06	***	***	184.44	1.31	1.54	-0.55	3.80
			June 5, 1985 - September 3, 1985 64 Trading Days					
S&P 500	***	190.04	187.91	189.97	-0.04	3.47	-2.36	***
-5%	180.54	***	***	187.45	-1.36	2.61	-2.22	1.33
0%	190.04	***	***	190.54	0.26	1.22	-0.56	-0.30
			September 5, 1985 - December 2, 1985 63 Trading Days					
S&P 500	***	187.37	200.46	202.46	8.05	9.11	-3.33	***
-5%	178.00	***	***	199.66	6.56	7.66	-2.92	1.49
0%	187.37	***	***	194.52	3.82	4.88	-0.74	4.24
			December 4, 1985 - March 3, 1986 62 Trading Days					
S&P 500	***	200.86	225.42	227.49	13.25	13.98	1.11	***
-5%	190.82	***	***	223.82	11.43	12.17	0.82	1.82
0%	200.86	***	***	216.05	7.56	8.28	0.07	5.69
			March 5, 1986 - June 2, 1986 63 Trading Days					
S&P 500	***	224.38	245.04	247.12	10.13	11.41		
-5%	213.16	***	***	242.35	8.01	9.31	-0.01	2.12
0%	224.38	***	***	232.17	3.47	4.71	0.01	6.66
			June 4, 1986 - September 2, 1986 64 Trading Days					
S&P 500	***	245.51	248.52	250.65	2.09	3.99	-4.42	***
-5%	233.23	***	***	246.66	0.47	2.39	-3.67	1.63
0%	245.51	***	***	245.47	-0.02	0.87	-0.75	2.11
			September 4, 1986 - December 1, 1986 63 Trading Days					
S&P 500	***	250.08	249.05	251.12	0.41	1.51	-7.83	***
-5%	237.58	***	***	246.01	-1.63	1.10	-5.10	2.04
0%	250.08	***	***	249.38	-0.28	0.33	-1.21	0.69

* *The portfolios are rebalanced daily.*

Table 5.
Insured vs. Uninsured Index Portfolios*
(Transactions Costs Included)

Index/Futures Version

Portfolio	Floor Level	Initial Index	Final Index	Final Portfolio	Portfolio Percent Change	Maximum Percent Change	Minimum Percent Change	Cost
			January 31, 1983 - March 1, 1983 22 Trading Days					
S&P 500	***	144.51	150.88	151.53	4.83	4.83	-1.03	***
-5%	137.28	***	***	150.05	3.83	3.83	-0.91	0.99
0%	144.51	***	***	143.46	-0.73	0.16	-0.85	5.55
			March 3, 1983 - June 1, 1983 64 Trading Days					
S&P 500	***	152.30	162.55	164.36	7.92	10.23	-1.58	***
-5%	144.68	***	***	161.81	6.25	8.61	-1.07	1.67
0%	152.30	***	***	154.54	1.47	3.60	-0.26	6.45
			June 3, 1983 - September 2, 1983 66 Trading Days					
S&P 500	***	163.98	165.00	166.86	1.75	4.54	-2.12	***
-5%	155.78	***	***	163.96	-0.01	3.87	-3.14	1.77
0%	163.98	***	***	161.77	-1.35	1.97	-2.15	3.10
			September 7, 1983 - December 1, 1983 62 Trading Days					
S&P 500	***	167.89	166.49	168.25	0.21	3.24	-2.89	***
-5%	159.50	***	***	166.04	-1.10	2.47	-3.47	1.31
0%	167.89	***	***	167.78	0.06	0.91	-1.00	0.28
			December 5, 1983 - March 1, 1984 62 Trading Days					
S&P 500	***	165.54	158.19	160.01	-3.34	2.68	-5.79	***
-5%	157.26	***	***	156.65	-5.37	2.06	-6.09	2.03
0%	165.54	***	***	166.26	0.43	1.21	-1.08	-3.77
			March 5, 1984 -June 1, 1984 64 Trading Days					
S&P 500	***	159.24	153.24	155.14	-2.57	2.46	-4.48	***
-5%	151.28	***	***	152.65	-4.14	1.39	-5.24	1.57
0%	159.24	***	***	160.07	0.52	0.83	-1.13	-3.10
			June 5, 1984 - September 4, 1984 65 Trading Days					
S&P 500	***	154.34	164.88	166.85	8.11	9.82	-3.53	***
-5%	146.62	***	***	164.12	6.34	8.24	-3.72	1.77
0%	154.34	***	***	159.60	3.41	5.25	-1.69	4.70
			September 6, 1984 - December 3, 1984 63 Trading Days					
S&P 500	***	164.29	162.82	164.73	0.27	4.53	-1.16	***
-5%	156.08	***	***	162.00	-1.39	3.17	-1.68	1.66
0%	164.29	***	***	165.22	0.57	1.37	-0.36	-0.30

Table 5 continued

Portfolio	Floor Level	Initial Index	Final Index	Final Portfolio	Portfolio Percent Change	Maximum Percent Change	Minimum Percent Change	Cost
				December 5, 1984 - March 1, 1985 61 Trading Days				
S&P 500	***	163.38	183.23	185.17	13.34	13.34	-0.83	***
-5%	155.21	***	***	182.58	11.75	11.82	-0.85	1.59
0%	163.38	***	***	177.48	8.63	8.70	-0.42	4.71
				March 5, 1985 - June 3, 1985 64 Trading Days				
S&P 500	***	182.06	189.32	191.36	5.11	5.22	-2.88	***
-5%	172.96	***	***	189.50	4.09	4.30	-2.72	1.02
0%	182.06	***	***	186.66	2.53	2.68	-1.38	2.59
				June 5, 1985 - September 3, 1985 64 Trading Days				
S&P 500	***	190.04	187.91	189.97	-0.04	3.47	-2.36	***
-5%	180.54	***	***	187.78	-1.19	2.89	-2.19	1.15
0%	190.04	***	***	191.79	0.92	2.08	-0.75	-0.96
				September 5, 1985 - December 2, 1985 63 Trading Days				
S&P 500	***	187.37	200.46	202.46	8.05	9.11	-3.33	***
-5%	178.00	***	***	199.80	6.64	7.74	-3.16	1.42
0%	187.37	***	***	196.48	4.86	5.94	-1.03	3.19
				December 4, 1985 - March 3, 1986 62 Trading Days				
S&P 500	***	200.86	225.42	227.49	13.25	13.98	1.11	***
-5%	190.82	***	***	224.42	11.73	12.47	0.87	1.52
0%	200.86	***	***	217.44	8.25	8.98	0.08	5.00
				March 5, 1986 - June 2, 1986 63 Trading Days				
S&P 500	***	224.38	245.04	247.12	10.13	11.41		
-5%	213.16	***	***	243.10	8.34	9.65	-0.09	1.79
0%	224.38	***	***	232.76	3.73	4.99	0.33	6.40
				June 4, 1986 - September 2, 1986 64 Trading Days				
S&P 500	***	245.51	248.52	250.65	2.09	3.99	-4.42	***
-5%	233.23	***	***	246.26	0.30	2.30	-4.16	1.79
0%	245.51	***	***	245.11	-0.16	1.31	-1.10	2.26
				September 4, 1986 - December 1, 1986 63 Trading Days				
S&P 500	***	250.08	249.05	251.12	0.41	1.51	-7.83	***
-5%	237.58	***	***	245.40	-1.87	1.21	-5.49	2.29
0%	250.08	***	***	247.83	-0.90	0.44	-0.90	1.32

** The portfolios are rebalanced daily.*

Notes

[1]Rubinstein (1987, p. 73) defines a derivative asset as "an asset whose payoffs are completely determined by the prices or payoffs of other underlying assets." The underlying asset discussed in the article is the S&P 500 index, which is a value-weighted index of 500 stocks selected by the Standard and Poor's Corporation. The weight of each stock in the index is the ratio of the market value of outstanding shares for that stock to the market value of all outstanding shares for the 500 stocks.

[2]The actual cash value of the S&P 500 futures contract is 500 times the index value. For expositional convenience, it is assumed that the underlying asset size for either futures or option contracts is equal to one index unit.

[3]See Leland (1980).

[4]In addition to the assumption cited as an example in the text, other important assumptions of the model that will be discussed in more detail are that trading in stock and options takes place continuously, that the stock volatility is constant, and that the stock pays no dividends.

[5]The rate of interest used in discounting future values is the risk-free rate. Technically, the choice of the risk-free rate is only appropriate for a world of risk-neutral investors, in which equilibrium expected rates of return on *all* assets equal the risk-free rate. However, the Black-Scholes call option pricing equation is valid for any degree of risk aversion because the equation's derivation is based on the valuation of a riskless hedge portfolio of stock and calls. Smith (1976, pp. 22-23) and Jarrow and Rudd (1983, chapters 7 and 8) discuss the so-called risk neutrality argument. Although the interpretations regarding present discounted values offered in this section of the article are strictly correct only for a risk-neutral world, the value of the insured portfolio in terms of the underlying variables is correct for any degree of risk aversion.

[6]Smith (1976) contains an excellent exposition of the solution technique for call options.

[7]K•DF dollars invested in T-bills will increase to K dollars by the expiration date due to the accumulation of interest.

[8]There is no one method for estimating volatility. All existing techniques are ad hoc. The volatility calculations used for the simulations employed a 30-trading-day moving average of the squared log (dividend-adjusted) index price relatives.

[9]A study by Garcia and Gould (1987) is a comprehensive simulation that attempts to evaluate the cost of portfolio insurance. Ad hoc procedures are used to ensure a firm floor. They conclude that "the evidence does not indicate that a dynamically balanced, insured portfolio will over the long run outperform a static mix portfolio" (p. 44). They claim that their method is biased in favor of portfolio insurance, but certain aspects of their procedure, particularly their stop-out rule, may bias the results the other way.

[10]There has been concern expressed in the financial press about the apparent inadequate liquidity of the S&P 500 futures contract. See Falloon (1987, p. 63). Addressing a related issue, Rubinstein (1987, p. 84) considers various hypotheses for the apparent mispricing of index futures, and states: "I am forced to the conclusion that even today the growth in index futures trading continues to outstrip the amounts of capital that are available for arbitrage."

[11]Because, in fact, a long index/short futures portfolio is not riskless, the implied interest rate will usually exceed the T-bill rate. See Kawaller (1987). This interest rate differential may partly explain the apparent mispricing.

[12]See Anders (1987).

[13]See Wallace (1987).

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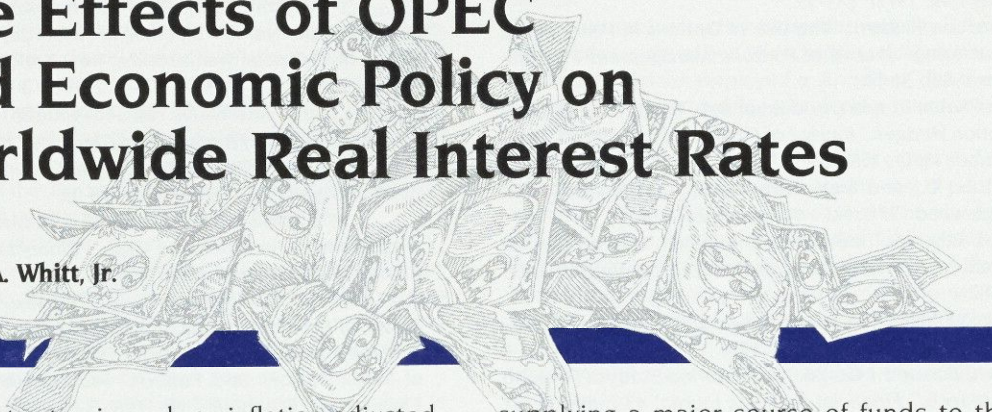
The Effects of OPEC and Economic Policy on Worldwide Real Interest Rates



Joseph A. Whitt, Jr.

Interest rates in real, or inflation-adjusted, terms scaled record heights in the United States during the early 1980s. What has not always been appreciated, however, is that the increase in rates was a worldwide phenomenon. The global nature of the rate movement can readily be explained by the high degree of mobility that characterizes today's international capital markets. Such mobility means that, almost regardless of where they occur, policy changes or other events can in principle affect real interest rates both here and abroad. While this interconnectedness of the international economy is clear, there nonetheless remains the question of what particular factors caused the worldwide surge in real interest rates during this period.

In keeping with the conventional view, Martin Feldstein (1985) claims that expansionary U.S. fiscal policy was mainly responsible, for it pushed up foreign as well as domestic rates and also induced foreign governments to impose contractionary monetary policies to defend their currencies. A less familiar factor that may have affected real interest rates worldwide is the behavior of the Organization of Petroleum-Exporting Countries (OPEC). Following the oil price hikes of 1973-74 and 1979-80, oil exporters enjoyed enormous current account surpluses. To a considerable degree, these nations recycled their surpluses into the financial markets of the major industrialized countries, at times supplying a major source of funds to those markets.

This study investigates the links between real interest rates and budget deficits, monetary policy, and OPEC surpluses in the seven largest industrial economies (the United States, the United Kingdom, Germany, France, Italy, Japan, and Canada) during the 1970s and early 1980s.[1] The results indicate that widening budget deficits and slowdowns in money growth were associated with higher real interest rates during those years, while increases in OPEC's surpluses were associated with lower rates. The findings also suggest that U.S. policy actions affect rates in the other six OECD countries and that policy actions by those countries as a group can have a significant impact on this nation's domestic rates. Apparently, a combination of factors—large budget deficits and tighter monetary policy both in the United States and abroad, along with a sharp drop in OPEC's surpluses—exerted upward pressure on real interest rates during the early 1980s. Thus, it is not surprising that rates reached unprecedented heights.

Before turning to a discussion of possible determinants of real interest rates, it is useful to consider how rate movements can spread rapidly through international capital markets. This integration seems evident in the broad similarities of actual movements in short-term real interest rates, which are documented for all seven industrialized countries over the period 1960-84. The statistical model used for this study, a version of the loanable funds model of

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Looking at the seven largest industrial economies, this study shows that, during the 1970s and early 1980s, widening budget deficits, straitened money growth, and a pronounced swing in OPEC's current account from surplus to deficit were linked with higher real interest rates.

interest rate determination extended to allow for the effects of OPEC surpluses and international capital mobility, as well as empirical estimates of the model, are detailed in an accompanying box (see p. 35). Throughout this article, emphasis is given to interpreting the intuitive dimensions of the results.

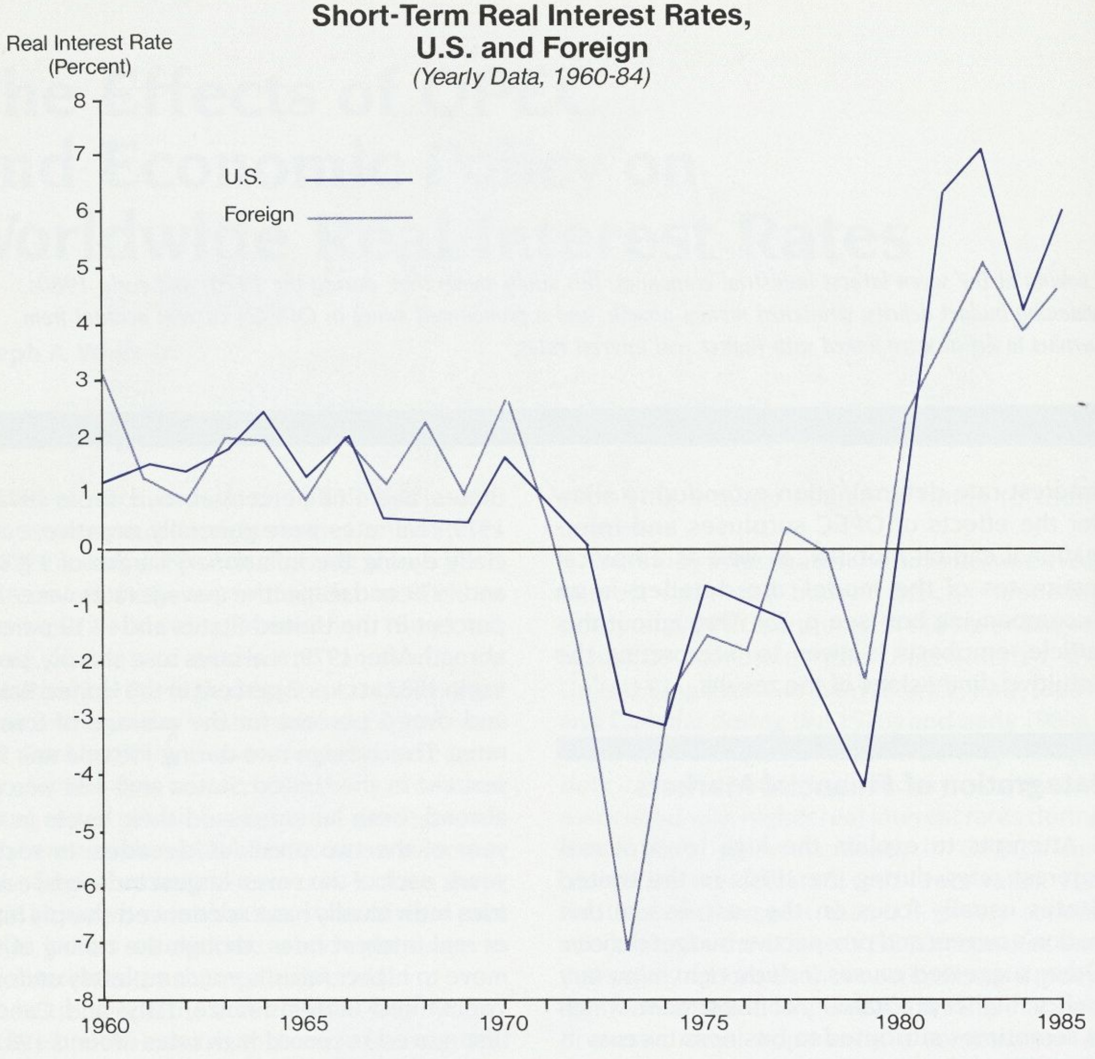
Integration of Financial Markets

Attempts to explain the high level of real interest rates during the 1980s in the United States usually focus on the vastness of this nation's current and prospective budget deficits. Other suggested causes include tight monetary policy; higher profitability of investment, which is sometimes attributed to business tax cuts in the United States; greater uncertainty about future inflation; and deregulation of financial markets.[2] Unfortunately, such U.S.-centered approaches tend to ignore the international nature of the rate phenomenon.

When the short-term *ex post* real interest rate on U.S. Treasury bills is plotted against a weighted average of similar rates in Japan, Germany, France, Italy, the United Kingdom, and Canada for the years since 1960, some striking similarities emerge (see Chart 1).[3] At the risk of oversimplification, the data seem to fall into three periods. From 1960 to 1971, both of these real interest rates were always positive, fluctuating between zero and 3 percent. The average rate for the period was 1.33 percent in the United States, and 1.68 percent abroad. From 1972 to 1979, real rates were generally negative, especially during the inflationary surges of 1973-74 and 1979, and respective average rates were -1.96 percent in the United States and -2.19 percent abroad. After 1979, real rates rose sharply, peaking in 1982 at over 7 percent in the United States and over 5 percent for the average of foreign rates. The average rate during 1981-84 was 5.88 percent in the United States and 4.33 percent abroad; both far surpassed their levels in any year of the two previous decades. In recent years, each of the seven largest industrial countries individually has experienced sharply higher real interest rates, though the timing of the move to higher rates is not completely uniform. The United States, France, Italy, and Canada first moved to record high rates around 1981, a year after Japan, Germany, and the United Kingdom.

The degree of cross-country uniformity in interest rate movements is statistically embodied in the correlation coefficient for pairs of the seven countries (see Table 1).[4] Because of the way correlation coefficients are calculated, they must lie between plus one and minus one. A positive correlation indicates that when one variable rises, the other usually rises also; a negative correlation indicates that when one variable rises, the other usually falls. A zero correlation implies that knowing the movement of one variable provides no information about the direction of movement of the other. When large positive (or negative) correlations are present,

Chart 1.



Source: See data appendix.

knowing the movement of one variable gives a lot of information about the movement of the other; in extreme cases where the correlation equals plus or minus one, each variable can be predicted perfectly on the basis of movements in the other.

In every case the correlation between the countries' short-term real interest rates is positive, indicating that rates in each pair of countries tended to move at the same time and in the same direction during this period. Taking the United States versus each of the other six countries, the correlations range from a minimum of 0.477 (with Germany) up to 0.857 (with Italy).[5] The large number of sizable positive correlations (14 out of 21 pair-wise correlations are larger than 0.5) corroborates the idea that interest rates in these countries are linked in some way, rather than being independent of one another.

As mentioned earlier, one connection between real interest rate movements in different countries arises from the international mobility of financial capital. To some degree, real interest rates may be determined on a global basis because large amounts of financial capital can

Table 1.

Correlation Matrix of Short-Term Real Interest Rates in Seven OECD Countries, 1960-84

	U.S.	U.K.	Germany	France	Italy*	Japan	Canada
United States	1.000	.699 (.000)	.477 (.016)	.816 (.000)	.857 (.000)	.591 (.002)	.792 (.000)
United Kingdom	.699 (.000)	1.000	.398 (.049)	.646 (.001)	.724 (.003)	.436 (.029)	.623 (.001)
Germany	.477 (.016)	.398 (.049)	1.000	.584 (.002)	.387 (.172)	.093 (.658)	.453 (.023)
France	.816 (.000)	.646 (.001)	.584 (.002)	1.000	.862 (.000)	.448 (.025)	.693 (.000)
Italy*	.857 (.000)	.724 (.003)	.387 (.172)	.862 (.000)	1.000	.706 (.005)	.695 (.006)
Japan	.591 (.002)	.436 (.029)	.093 (.658)	.448 (.025)	.706 (.005)	1.000	.616 (.001)
Canada	.792 (.000)	.623 (.001)	.453 (.023)	.693 (.000)	.695 (.006)	.616 (.001)	1.000

Significance levels are given in parentheses below the correlations.

* Because of missing data, the correlations involving Italy cover only the years 1971-84.

move quickly to seek higher real returns in another country's capital market. Given this rapid funds mobility, policy changes or other events that raise real interest rates in one nation should spill over to lift rates elsewhere as well. In the extreme case of perfect capital mobility, real interest rates would presumably be equalized internationally, and all the correlations in Table 1 would be one. However, financial market integration for these seven countries was incomplete for the years 1960-84, as indicated by the number of correlations that are positive but considerably smaller than one.[6]

Another possible linkage would arise if there are common factors in the world economy that influence interest rates in all these countries simultaneously. A plausible candidate during this period is the impact of OPEC's surpluses.

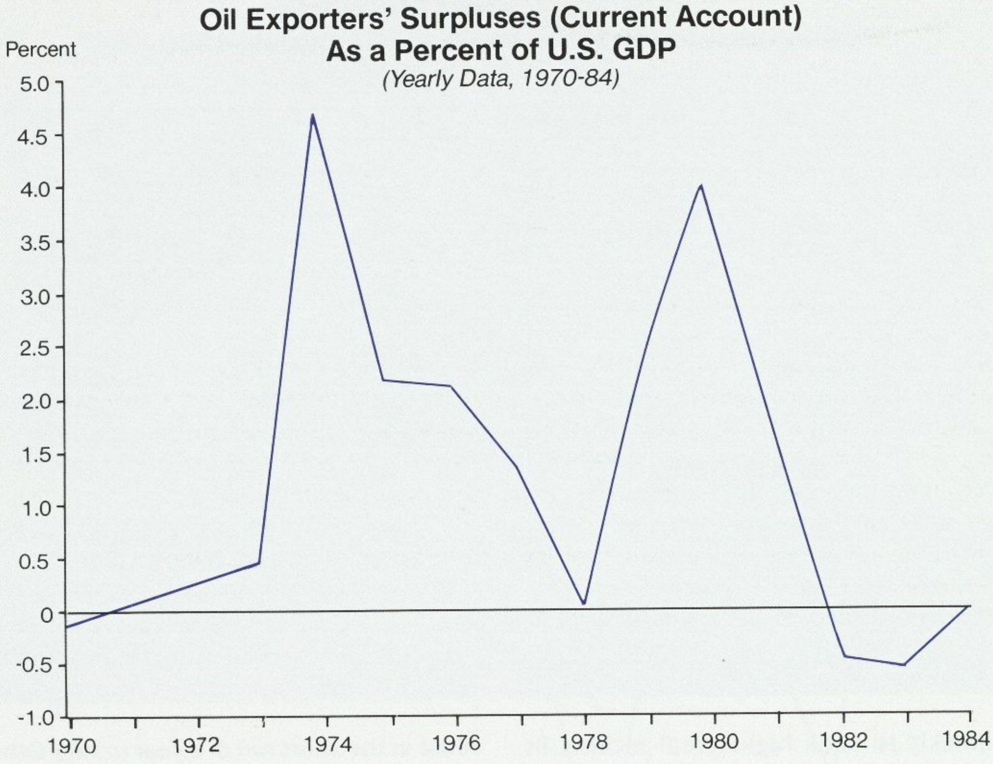
Macroeconomic Determinants of Real Interest Rates

Monetary and Fiscal Policy. Conventional economic wisdom holds that monetary and fiscal policy alike can affect the real interest rate, at least in the short run of a year or two. Other factors being equal, slow growth of the money supply and large budget deficits both push real interest rates upward.

In recent years, however, the accepted view has been challenged on theoretical as well as empirical grounds. Arguing theoretically, Robert J. Barro (1974) contends that rational households would recognize that for a given course of government expenditure, a larger deficit today will require higher taxes in the future to service the debt. To maintain their individually preferred consumption paths, households would react to present changes in the deficit with offsetting changes in their patterns of saving. The net effect of this behavior would be to prevent a shift in the deficit from altering aggregate demand or real interest rates.

Empirical studies on the relationship between U.S. budget deficits and real interest rates have yielded mixed, even conflicting, results.[7] One reason for such an outcome is that a number of different measures exist for the stance of fiscal policy. For example, the budget deficit usually reported in the press may not equal the total borrowing by the government, in

Chart 2.



Source: See data appendix.

part because the figure excludes borrowing by certain federal agencies such as the Postal Service and the Federal Home Loan Banks. In addition, many analysts adjust the deficit to try to remove the effects of cyclical fluctuations. Economic downturns tend to increase the reported deficit more or less automatically, as they cut tax revenues while boosting government spending on programs such as unemployment compensation. Economic booms have the opposite effects. Such shifts in the deficit can be interpreted not as changes in fiscal policy but as the consequences of other shocks to the economy. The "structural" or "full-employment" deficit is an adjusted measure to reflect what the actual deficit would be in the absence of cyclical fluctuations. Alternatively, some analysts adjust reported deficits to incorporate the gain to the government from inflation's effect on the real value of previously issued debt. Finally, portfolio considerations have led some authors to focus on the level of outstanding debt relative to gross national product (GNP), rather than on the deficit figure itself, as a measure of fiscal policy.

Given the ambiguous results produced by these studies, the link between budget deficits and real interest rates remains uncertain in the case of the United States. Investigations that focus on the experience of other countries also yield mixed results. While Michael M. Hutchison and David H. Pyle (1984) report that, for the seven largest OECD countries, higher budget deficits have a significant impact in raising real interest rates, Demetrios S. Giannaros and Bharat R. Kolluri (1984) find no significant relationship between the two in the majority of the six industrialized countries they analyze.

In all the foregoing analyses, each country's budget deficit is seen as affecting only its own real interest rate. However, if world capital markets are truly integrated, then budget deficits and other possible determinants of real interest rates in the United States may affect rates abroad, and vice versa. Within an international context, many analysts have homed in on U.S. budget deficits—for example, Martin Feldstein (1985) and William H. Branson (1985)—or a combination of loose fiscal and tight monetary policy in this country in order to explain the worldwide rise in real interest rates during the early 1980s.[8] Unfortunately, relatively little attention has been focused on policy actions in other countries, no doubt partly because each of the other OECD countries has a substantially smaller economy than the United States. Taken as a group, though, the other major OECD countries are larger than the United States in economic size. In a world of capital mobility, this relationship suggests that their policy actions might be important determinants of real interest rates.

A few researchers who have examined policy actions in the OECD as a whole have questioned the predominant role of the U.S. budget deficit in explaining interest rate movements during the early 1980s. They point out that the expansion in the U.S. structural deficit occurred at the same time that such deficits were shrinking in some other countries, notably Japan, Germany, and Britain. Paul Atkinson and Jean-Claude Chouraqui (1985) claim that while this nation's structural deficit (including state and local governments) increased by 3.3 percent of the U.S. GNP between 1979 and 1985, the aggregate deficit for the seven biggest OECD economies (including the United States) rose by only 0.3 percent of combined GNP.[9] Looking at the aggregate pattern of government deficits among the major countries, Olivier J. Blanchard and Lawrence H. Summers (1984) conclude that the increase was too small to explain the surge in real interest rates that occurred early in this decade.

Returning to the question of measurement, Sweder Van Wijnbergen (1985) maintains that structural deficits are not appropriate in analyzing the effects of fiscal policy on interest rates, for it is the actual deficit that must be financed in the capital markets.[10] Using inflation-adjusted measures of actual budget deficits, he shows that the gaps widened considerably during the early 1980s, not only in the United States but in other major OECD countries as well. Another measure of fiscal policy, the ratio of debt to GNP, even suggests that although U.S. fiscal policy was loose in the early 1980s, it was looser still in other major industrialized countries.[11]

OPEC Surpluses. Another factor that may have affected real interest rates globally is OPEC's capital outflow. Twice in recent years, sharp oil price increases have been followed by enormous trade and current account surpluses for OPEC. As they were "recycled" through the international financial system, these surpluses can be looked at as having been a major source of loanable funds in the capital markets of industrialized countries. From another perspective, the funds generated by the higher price of oil can be interpreted as a major transfer of income from industrialized countries and non-oil-exporting less developed countries (LDCs) to oil exporters. If the latter save more than the oil importers, then the income transfer will raise worldwide savings and possibly lower real interest rates on a global basis.[12]

Considering the vastness of OPEC's current account surpluses in the years just following the major oil price hikes, it seems plausible that the group's marginal propensity to save indeed surpassed that of the oil importers, at least in the short run of a year or two. Over the period 1970-84, the oil exporters' surpluses underwent sizable swings (see Chart 2).[13] Starting from a small deficit in 1970, the surplus soared after the first oil price shock, which was associated with the Arab-Israeli war of late 1973, to peak in 1974 at 4.7 percent of U.S. gross domestic product (GDP). Over the next several years, as OPEC members' spending rose in response to their higher level of income, their current account surplus dwindled, turning into a small deficit in 1978. At that point the Iranian revolution set off the second oil price shock, producing surpluses that reached 4.0 percent of U.S. GDP in 1980. Just two years later, however, the oil exporters' surplus had disappeared.

Relative to worldwide savings, OPEC's current account surplus may have been too small to affect global interest rates significantly. At its peak, OPEC's surplus was about 6 percent of gross savings in the OECD countries. Nonetheless, results of econometric analysis by Jo Anna Gray and Peter Hooper (1983) suggest that the second OPEC shock may have accounted for somewhat more than half the rise in short-term real rates between mid-1979 and mid-1981 and

Table 2.

Correlations between OPEC's Current Account Surplus and Short-Term Real Interest Rates in Seven OECD Countries

	U.S.	U.K.	Germany	France	Italy	Japan	Canada
Correlation	-.471	-.536	-.027	-.525	-.575	.102	-.388
Significance Level	(.076)	(.040)	(.924)	(.044)	(.032)	(.717)	(.153)

Note: To adjust for inflation and growth, OPEC's current account surplus was expressed as a percentage of U.S. nominal GDP. Annual data for the period 1970-84 were used for all countries except Italy; in that case, the sample period was 1971-84.

that it contributed to maintaining high rates at least through 1982.[14] Another meaningful measure is to compare OPEC's surplus with the U.S. budget deficit. From 1980 to 1982, OPEC's surplus declined by 4.6 percent of U.S. nominal GDP while our domestic budget deficit grew by a relatively small 1.8 percent of GDP.

Correlation coefficients indicate that high surpluses for oil exporters were associated with low real interest rates during the period 1970-84 (see Table 2). All of the correlations for the seven leading OECD countries are negative, as would be expected if oil exporters' surpluses raised the supply of loanable funds, thereby pushing down real interest rates. The United Kingdom, France, and Italy all have correlations larger (in absolute value) than 0.5, and the U.S. correlation is nearly that large; only the German and Japanese interest rates show little correlation with OPEC's surpluses.

It seems clear that both budget deficits and OPEC surpluses had some bearing on real interest rates worldwide and that integrated capital markets provided a medium for the spread of rate movements. The model that is detailed in the accompanying box takes all these factors into account (see p. 35).

Interpreting the Model's Results

The regression results from the model used in this study indicate that a number of factors—particularly budget deficits at home and abroad, monetary policy at home and abroad, and the size of OPEC's surplus—all help to determine real interest rates in each country. These explanatory factors changed considerably over the years of the sample (1971-83), thereby providing insight into the causes of the dramatic swings in real interest rates since the early 1970s.[15]

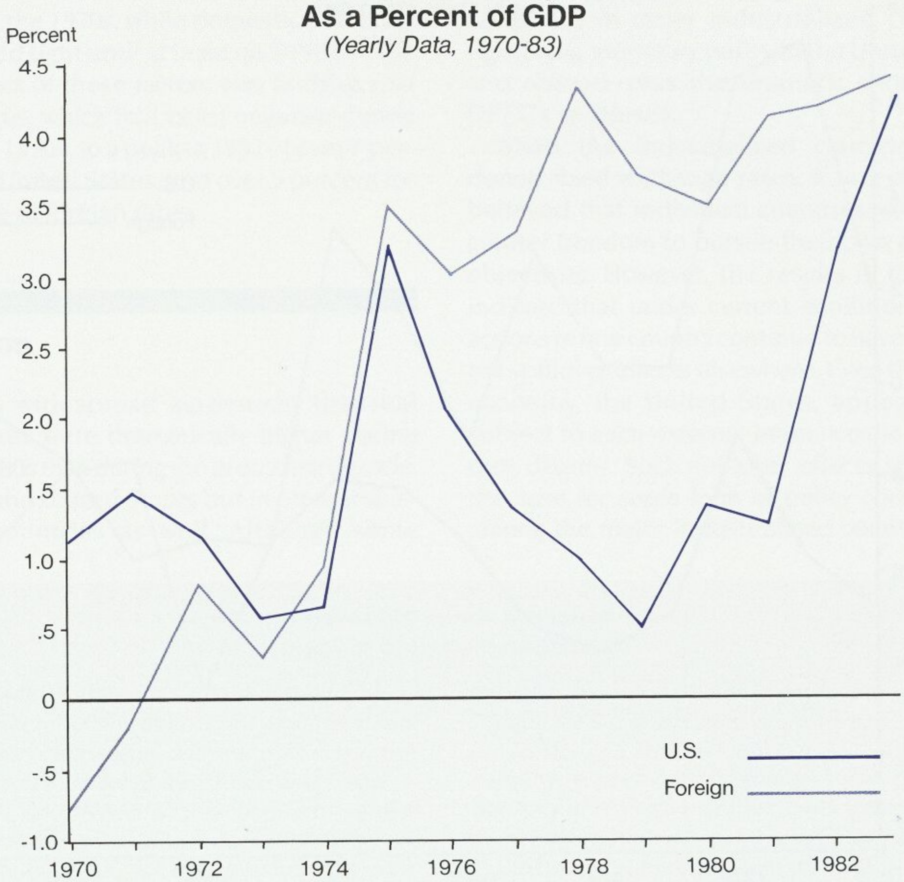
In the case of the budget deficit, a time plot of the central government budget deficit for the United States as well as a weighted average deficit for the other six countries reveals the growing size and frequency of our domestic budget deficits in recent years (see Chart 3). Note that, within the model, the budget deficit was not adjusted for cyclical or price effects. Using this measure, the U.S. deficit exceeded 1 percent of GDP during only two years of the 1960s, whereas it did so in seven years of the last decade and every year of the 1980s.

Budget deficits in the other six countries have also been large in recent years.[16] For the period from 1960 into the early 1970s, the weighted average usually shows a small surplus. In 1975, however, the weighted average deficit soared to over 3 percent of these countries' nominal GDP. Moreover, their average deficit remained at or above 3 percent of GDP during each of the ensuing years of the sample period. It is important to note that the increase in the weighted average deficit for the six foreign countries is not attributable to larger deficits in just one or two countries.[17] All six foreign countries had sharply larger budget deficits in 1975 and ensuing years than previously. Though surplus years were fairly common for many countries during the 1960s, none had even a single year of budget surplus after 1974.

Chart 3.

Central Government Budget Deficits As a Percent of GDP

(Yearly Data, 1970-83)



Source: See data appendix.

Monetary growth has also fluctuated considerably over the sample period. (See Chart 4, a time plot of annual M1 growth in the United States, as well as a weighted average of growth rates for analogous monetary aggregates in the other six countries.) In the early 1970s, U.S. money growth picked up in the aftermath of the mild recession of 1970. At the same time, money growth soared dramatically abroad, especially in 1971-72, probably as a by-product of the attempts of foreign central banks to stave off the decline of the dollar during the breakup of the Bretton Woods system. This upsurge in money growth helps explain the sharp decline in real interest rates that occurred in 1972 and 1973, particularly considering that other explanatory variables such as budget deficits and OPEC's surplus showed little change in those years.

As for the OPEC surpluses, the first oil price shock of late 1973 resulted in massive payments surpluses for oil exporters. The level reached 4.7 percent of U.S. nominal GDP in 1974 and stayed above 2 percent through 1976. Since these surpluses were largely invested in the financial markets of the seven countries in this study's sample, they may have helped keep real interest rates down during these years.

By 1977, OPEC's surpluses were fading away, while foreign budget deficits, which had soared in the recession year of 1975, remained much larger than in the 1960s. Nevertheless, fairly low real interest rates persisted both in the United

Chart 4.

Growth in U.S. and Foreign Money

(Yearly Data, 1970-84)

Source: See data appendix.

States and abroad, probably because of another round of rapid money growth in the industrialized countries. As in the early 1970s, speedy money growth outside the United States may have been a by-product of the attempts by foreign central banks to slow the depreciation of the dollar.

In early 1979, the Iranian revolution set off another round of oil price hikes. As a result, the external surplus of the oil exporters rose dramatically in that year, by over 2 percent of U.S. nominal GDP, and peaked in 1980. Meanwhile, in order to fight inflation, central banks tightened monetary policy markedly, particularly outside the United States: average foreign money growth fell from 13.3 percent in 1978 to only 3.4 percent in 1980. In this environment, real interest rates plummeted in 1979 but rose the following year to the highest levels since the early 1970s.

In the last three years of the sample period (1981-83), a number of factors combined to push real interest rates to record levels. During that time, both the U.S. and the average foreign real interest rate exceeded levels attained in the preceding two decades. One factor spurring rates was the sharp increase in the U.S. budget deficit, which reached a record level of 4.3 percent of nominal GDP in 1983. Although budget deficits rose more modestly abroad, their average exceeded 4 percent of foreign GDP for each year from 1981 to 1983. Meanwhile, from 1980 to 1982, OPEC's current account swung from a huge surplus to a sizable deficit, declining by 4.5 percent of U.S. nominal GDP. Finally, monetary growth outside the United States remained well below the rates of the 1970s, while domestic monetary policy stayed tight until at least mid-1982.[18] The overall effect of these factors was to drive real interest rates, which had been negative during most of the 1970s, to a peak in 1982 of over 7 percent in the United States, and over 5 percent for the average of foreign rates.

Conclusion

There is widespread agreement that real interest rates were dramatically higher during the early 1980s than during the preceding decade, not just in the United States but in other industrialized countries as well. Although some attribute the worldwide surge in real interest rates almost exclusively to rising U.S. budget deficits, this article presents evidence of other contributing factors. Among them are loose fiscal policy in other industrialized countries, tightening monetary policy in the United States and abroad, plus the dramatic shrinkage of OPEC's surpluses.

When the industrialized countries abandoned fixed exchange rates, it was commonly believed that individual countries would have greater freedom to pursue their own economic objectives. However, the results in this paper indicate that under current conditions, policy actions in one country continue to have substantial spillover effects elsewhere. Even the largest economy, the United States, appears to be subject to such external influences to a significant degree. Such spillover effects strengthen the case for some form of policy coordination among the major industrialized countries.

A Loanable Funds Model of Interest Rate Determination

The Model. To investigate further the relationship between budget deficits, oil exporters' surpluses, and short-term real interest rates, the framework of Michael M. Hutchison and David H. Pyle (1984), who related the real short-term interest rate in each country to local factors such as the respective budget deficit, can be extended by adding two factors representing conditions in the outside world:

$$r_{it} = f\,(B_{it}, Z_{it}, OPEC_t, XRR_{it}, e_{it}), \qquad (1)$$

where r_{it} is the real interest rate in country i during time period t; B_{it} is the fiscal budget deficit of country i in period t, expressed as a percentage of its GDP (it is not adjusted for cyclical or price effects); Z_{it} is a vector of other local influences on country i's real interest rate; $OPEC_t$ measures the aggregate net foreign lending of the oil-exporting countries as a percentage of U.S. nominal GDP; XRR_{it} is a weighted average of real interest rates in countries other than country i; e_{it} is the error term.

Equation (1) specifies the real interest rate in country i to be a function f of external influences ($OPEC_t$ and XRR_{it}) as well as local factors (B_{it} and Z_{it}).[1] Just as the local budget deficit represents a demand for loanable funds in each country, OPEC's surplus represents a source of funds for them all.[2] The average external real interest rate for each country (XRR_{it}) is included to capture the impact on country i's interest rate of partial capital mobility; if rates outside country i rise, perhaps because of monetary or fiscal policy changes by those other countries, then capital flows will tend to pull rates up in country i as well.

The vector Z_{it} represents all local variables (other than B_{it}) that affect r_{it}. If equation (1) is estimated in a regression framework, it is particularly important that Z_{it} include any "true" explanatory variables that are correlated with B_{it}, $OPEC_t$, or XRR_{it}; otherwise, the coefficients on B_{it}, $OPEC_t$, and XRR_{it} are likely to be biased.[3] Following Hutchison and Pyle, two variables are included in Z_{it}: money growth (DM_{it}) and the unemployment rate (U_{it}). Each country's money growth is incorporated as a measure of monetary policy, which may have some influence over its real interest rate, especially the short-term rates considered here. An increase in money growth is presumably associated with an increase in the supply of credit and, hence, with lower real interest rates. The unemployment rate is included in Z_{it} as a way of adjusting for possible cyclical movements in real interest rates caused by cyclical movements in private credit demand and supply.[4]

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As noted earlier, some investigators prefer to use structural or cyclically adjusted budget deficits to try to eliminate this bias. However, Blanchard and Summers (1984) and Atkinson and Chouraqui (1985) suggest that structural deficits in the OECD as a whole did not rise enough to explain the worldwide surge in real interest rates during the early 1980s. Moreover, data on cyclically adjusted deficits in these seven countries in Robert Eisner (1986) are inconsistent with the idea that cyclically adjusted deficits contributed to the dramatic rise in short-term real interest rates in the early 1980s. Eisner's data for the United States show increasing cyclically adjusted surpluses in 1981 and 1982, while a weighted average of his data for the other six countries in my sample shows steadily declining deficits from 1979 through 1982. Eisner's estimates of deficits after adjustment for both price and cyclical effects show similar patterns during these years.

For empirical estimation, equation (1) was specified in a linear form, as follows:

$$r_{it} = a_i + a_1 B_{it} + a_2 DM_{it} + a_3 U_{it} + a_4 OPEC_t + a_{5i} XRR_{it} + e_{it}, \qquad (2)$$

where the a's are coefficients. The specification in (2) requires that the estimated responsiveness of r_{it} to B_{it}, DM_{it}, U_{it}, and $OPEC_t$ be the same for all seven countries.[5]

The standard view of the effects of budget deficits and money growth would suggest that the estimated coefficient a_1 should be positive while a_2 should be negative. If OPEC's surplus increases world savings and pushes down real interest rates, the coefficient a_4 should be negative. Partial capital mobility would imply that if real rates rise in one or more countries, then rates should be pulled up in the other countries as well; hence a_5 should be positive.[6]

Empirical Results. Variants of equation (2) were estimated using Zellner's seemingly unrelated equations technique with annual data for the seven largest OECD countries: the United States, Japan, West Germany, the United Kingdom, France, Italy, and Canada.[7] Annual data are used because more frequent data are not readily available for every variable in all these countries. Moreover, quarterly or monthly data seem more likely to be distorted by minor differences in timing between bond sales, government expenditures or receipts, OPEC lending, or changes in monetary policy, on the one hand, and the dates when market participants incorporate new information about the economic situation in their expectations, on the other. The estimation results are presented in Table 3. Because of data limitations, the sample period in Table 3 covers only 13 years, 1971-83.[8]

The measurement of the real interest rate merits special attention. Survey data on inflationary expectations, such as the Livingston data for the United States, are not readily available for most of the OECD countries. (The Livingston data consist of averages of U.S. inflation forecasts made by a number of economists and other financial market participants who are surveyed twice a year by Joseph Livingston, a financial reporter.) Instead, an *ex post* measure of inflation was created by calculating quarter-to-quarter annualized percentage changes in the consumer price index for each country. These inflation rates were then subtracted from quarterly data on short-term nominal interest rates, and then averaged over each calendar year to obtain annual data on the real short-term interest rate in each country.[9]

The first three columns of Table 3 contain the results using only the local explanatory variables for each country, as in Hutchison and Pyle. If the budget deficit is the only explanatory variable (column 1), its estimated coefficient is both positive, which indicates that a larger deficit raises real interest rates, and sizable; the estimated coefficient of 0.780 implies that if the budget deficit increases by 1 percent of GDP, then the short-term real interest rate rises by 78 basis points. When local money growth is added (column 2), the coefficient on the budget deficit shrinks somewhat but remains significant; as expected, the estimated coefficient on money growth is negative, indicating that faster money growth tends to lower short-term real interest rates.

When the local unemployment rate is added as well (column 3), its coefficient is positive and significant; the positive sign is consistent with the hypothesis that real interest rates are lower during business upswings than during recessions because private savings expands more during upswings than does private demand for credit. More importantly, the inclusion of the unemployment rate has a considerable effect on the budget deficit's estimated coefficient: the coefficient shrinks drastically and becomes insignificant.

The fourth column of Table 3 contains the results when a dummy variable for years after 1980 is added, as in Vito Tanzi (1985), to check for a possible shift in interest rate behavior at that time.[10] The coefficient on the dummy variable is positive and highly significant, indicating that real interest rates rose after 1980 in these seven coun-

Table 3.

Real Interest Rate Equations
Estimated Subject to Cross-Country Parameter Restrictions
(Sample Period, 1971-83)

	(1)	(2)	(3)	(4)	(5)	(6)
Local Budget Deficit	0.780 (5.24)	0.509 (3.84)	0.057 (0.29)	0.518 (4.18)	0.323 (2.83)	0.222 (2.34)
Local Money Growth		-0.272 (-8.05)	-0.187 (-3.71)	-0.185 (-5.36)	-0.266 (-8.63)	-0.298 (-11.81)
Local Unemployment			0.661 (4.31)	-0.098 (-0.64)	-0.169 (-1.18)	-0.096 (-0.81)
DUMMY				4.198 (5.57)	0.816 (1.57)	
OPEC's Capital Outflow					-0.227 (-3.06)	-0.256 (-4.25)
Average External Real Interest Rate						
U.S. Equation					0.871 (5.60)	0.965 (5.40)
U.K. Equation					1.242 (4.19)	1.314 (4.49)
German Equation					0.211 (1.67)	0.331 (2.72)
French Equation					0.524 (4.58)	0.654 (4.69)
Italian Equation					0.870 (4.13)	0.873 (4.07)
Japanese Equation					0.714 (1.77)	0.522 (1.37)
Canadian Equation					0.751 (5.00)	0.885 (5.73)
Weighted R^2 for the System	0.249	0.504	0.346	0.518	0.887	0.943

Note: Approximate t-statistics are given in parentheses below the coefficients. The weighted R^2 for the system corresponds to the approximate F-test on all non-intercept parameters in each system of equations estimated. The variable DUMMY takes the value zero for the years 1971-80, and one for the years 1981-83.

tries in a manner not explained by the other variables included in this equation. Observe that including the dummy variable restores the significance of the coefficient on the budget deficit. Moreover, the coefficient on the dummy variable is quite large; it indicates that, in these seven countries, there was a rise of over 4 percentage points in real interest rates after 1980 that is attributable to the dummy variable and not to changes in the local budget deficit, money supply, or unemployment.

The last two columns of Table 3 contain the results when the external variables are included as additional explanatory variables. Column 5 also includes the dummy variable, while column 6 omits it. OPEC's capital outflow has a significant negative coefficient in both equations. The negative sign of its coefficient is consistent with the hypothesis that an increase in OPEC's capital outflow tends to lower real interest rates in the industrialized countries.

All of the countries show a substantive response to external interest rates, even after taking account of local monetary and fiscal policy, as well as OPEC's surplus. Most of the estimated coefficients on the average external real interest rate are sizable and significant. Even the United States,

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whose money market might be expected to be relatively immune to foreign influence because of the large size of the nation's economy, has a large coefficient on the external real rate.[11] Because the average external interest rate for any country is determined in part by other countries' fiscal and monetary policies, the sizable coefficients on the average external interest rate imply that foreign fiscal and monetary policies have some impact on real U.S. interest rates, and U.S. policies have some impact on foreign rates as well.

Adding the external variables results in a considerable shrinkage in both the size and significance of the coefficient on the dummy variable, as shown by a comparison of columns 4 and 5. Indeed, it is no longer significant at conventional levels. Accordingly, the influence of the external variables provides at least a partial explanation for the otherwise unexplained rise in real interest rates after 1980 reported by Tanzi and me.

The coefficients on the local budget deficit and money growth were relatively unaffected by adding the external variables; both remained significant and of the expected sign. The coefficient on unemployment changes sign and becomes insignificant when the dummy variable or the external variables are included; this is not too disturbing, because the sign of this coefficient is uncertain on a priori grounds.[12]

Notes

[1]It is implicitly assumed that governments finance their budget deficits by selling bonds in their own capital markets, not in foreign capital markets. While there has been some cross-border borrowing by these seven governments, it has generally been small relative to their domestic borrowing.

[2]In principle, it would be desirable to use data on the inflow of funds from OPEC to each country separately, rather than the aggregate OPEC surplus; however, such data are not readily available.

[3]A coefficient is said to be biased if the expected value of its estimate is not equal to the "true" value of the coefficient.

[4]The sign of the coefficient on unemployment is uncertain. During a business upswing, private demand for funds expands, but private savings (household savings and corporate retained earnings), which is a source of funds, also expands. The coefficient on unemployment should be positive if the changes in private savings predominate, and negative if the changes in private credit demand predominate.

[5]The specification in equation (2) allows each country to have its own coefficient on the external real interest rate (XRR_{it}) and intercept term. It is possible to estimate equation (2) without requiring the parameters a_1 - a_4 to be the same for all the countries; however, with so few data points available for each country, most of the parameter estimates are very imprecise in that case. Hutchison and Pyle similarly impose equality of parameters for all seven countries.

[6]In the case of perfect capital mobility, the real interest rate would presumably be identical in each country; in that case, r_{it} would be exactly equal to XRR_{it}, implying $a_5 = 1$. However, Table 1 shows that while rates in different countries show considerable positive correlation, they are not perfectly correlated.

[7]This technique, which is also known as joint generalized least-squares, is discussed in many econometrics texts; for an example, see Theil (1971), chapter 7.

[8]This sample period overlaps the 1973-82 period used by Hutchison and Pyle. To save space, the estimated constant terms have been omitted from the table; they are available from the author upon request.

[9]To measure inflation, Hutchison and Pyle use line 64x of *International Financial Statistics,* which gives year-over-year data. My procedure should give a much closer matching in terms of timing between the nominal interest rate data and the inflation rate data.

[10]Using a dummy variable analysis, Tanzi reported that there was a major shift upward (by about 4 percentage points) in U.S. short-term real interest rates after 1980; this increase was not explained by his measures of fiscal or monetary policy. The results for the relationship between fiscal policy and interest rates in Tanzi (1985 and 1987) as modified in response to Spiro (1987) were mixed; increased deficits (either unadjusted or cyclically adjusted) appeared to lower interest rates contemporaneously, the opposite of the conventional view, but increases in the level of public debt appeared to raise interest rates.

[11]It might be argued that the coefficient on the external interest rate in the U.S. equation is biased upward because of a simultaneity problem if the large U.S. economy has a major impact on interest rates elsewhere. Presumably this problem is much less severe for the smaller countries in the sample. An instrumental variables approach to the external interest rate in the U.S. equation of the system yielded an estimated coefficient of 0.806, modestly smaller than the estimates in Table 3.

[12]See the discussion in note 4 above.

Data Appendix

Nominal interest rates and consumer prices for each country were obtained from the IMF's *International Financial Statistics* (IFS). For the United States, the United Kingdom, and Canada, short-term nominal interest rates were taken from line 60c (the Treasury bill rate); for the other countries, line 60b (the call money rate) was used. Data on consumer prices were taken from line 64. Because of the prospective nature of the nominal interest rate data, quarterly *ex post* real interest rates were calculated by subtracting from each quarter's nominal interest rate the annualized percentage change in the CPI from that quarter to the next. Annual data on real interest rates were obtained by averaging the quarterly numbers just described.

Budget deficits for the countries studied were obtained from the Organization for Economic Cooperation and Development's (OECD) National Accounts, Detailed Tables; numbers for Net Lending were used. Budget deficits were scaled by dividing by nominal GDP figures, which were obtained from IFS, line 99b.

Annual data on the aggregate current account surplus of oil-exporting countries (OPEC's Capital Outflow) were obtained from the IFS Yearbook for IFS area 999.

Nominal money growth in each country was derived by taking percentage changes of annual data from line 34 of IFS.

Data on standardized unemployment rates were obtained from the OECD.

The average external real interest rate for each country is a weighted average of real interest rates in the other six countries. The weights are based on each country's share of the aggregate GDP for the group in the year 1978, which is roughly in the middle of the sample period. Each country's nominal GDP for 1978 (from IFS) was translated into U.S. dollars using the average exchange rate from IFS for that year. The resulting shares of aggregate GDP were as follows: United States, 42.7 percent; United Kingdom, 6.35 percent; Germany, 12.80 percent; France, 9.49 percent; Italy, 5.24 percent; Japan, 19.27 percent; and Canada, 4.15 percent.

Notes

[1]These seven countries are members of the Organization for Economic Cooperation and Development (OECD), a loosely organized group of industrialized countries in Europe, North America, and the Pacific which tries to promote better economic performance in its member countries.

[2]See Blanchard and Summers (1984) and Atkinson and Chouraqui (1985).

[3]The *ex post* real interest rate is computed with the benefit of hindsight, using the rate of inflation which actually occurred. In some cases, economists use the *ex ante* rate instead; it is defined as the nominal interest rate minus the expected (or anticipated) rate of inflation. No adjustment for taxes was made in calculating the *ex post* rates. Because of missing data, Italy is not included in the average for foreign countries prior to 1971. The weights used in the averaging procedure are based on each country's GDP. For further details, see the Data Appendix.

[4]Here, as in Chart 1, annual averages of quarterly real rates were used. Because of missing data for Italy, the time period for its correlations was limited to 1971 to 1984.

[5]Moreover, all six of the correlations involving the United States are statistically significant at the .05 level. Most of the correlations involving pairs of foreign countries are significant as well, with the exceptions of the correlation between Germany and Italy and the correlation between Germany and Japan.

[6]Cumby and Mishkin (1986) reach similar conclusions about the degree of international linkage in real rates between the United States and Europe. Also see Cumby and Obstfeld (1984).

[7]Plosser (1982), Canto and Rapp (1982), Hoelscher (1983), Makin (1983), Mascaro and Meltzer (1983), Dewald (1983), Motley (1983), and Evans (1985) report no significant link between U.S. budget deficits and interest rates, while de Leeuw and Holloway (1983), Barth, Iden, and Russek (1984-85), and Hoelscher (1986) find support for the conventional view.

[8]See Blanchard and Dornbusch (1984) or the comments by Blinder and Nordhaus following Blanchard and Summers (1984).

[9]See Atkinson and Chouraqui (1985), p. 16.

[10]Motley (1983) makes a similar argument in his discussion of the U.S. experience. An opposing view would be that the structural deficit is the appropriate gauge of fiscal policy, and that discrepancies between the actual and the structural deficit may represent the effects of monetary policy or other shocks to the economy.

[11]See De Grauwe and Fratianni (1983), pp. 73-74, and Chouraqui, Jones, and Montador (1986), pp. 107-11.

[12]Canzoneri and Gray (1982) and Gray and Hooper (1983) provide theoretical analyses showing that, if the marginal propensity to save is higher in OPEC than in other countries, then a negative correlation between OPEC's current account surplus and real interest rates can result. Also see Bruno and Sachs (1985).

An alternative interpretation of the impact of OPEC is that rises in oil and other raw materials prices during the 1970s cut the profitability and demand for real capital, because raw materials and capital are complementary factors of production. The decline in profitability and resulting fall in real investment also dragged down the real rate of interest. See Wilcox (1983).

[13]In the chart, OPEC's current account surpluses are expressed as percentages of U.S. nominal GDP, in order to adjust for inflation and growth. Data on the current account surpluses of the oil-exporting countries were obtained from the IMF's *International Financial Statistics,* area 999. The IMF definition of "Oil Exporting Country" differs slightly from the official membership of OPEC; the IMF includes Oman, which is not a member of OPEC, while excluding Ecuador and Gabon, which are members. Nevertheless, for the sake of brevity the acronym "OPEC" will be used in the remainder of the paper to refer to the oil-exporting nations.

[14]In the simulation, real interest rates bottom out and begin to rise in mid-1979, two quarters before the peak of OPEC's surplus, because income (hence savings) is falling in the industrialized countries in response to the shock. OPEC's surplus declines after the first quarter of 1980, thus contributing to further increases in real interest rates.

[15]Bruno and Sachs (1985, pp. 8-12) provide a similar chronology of policy actions during this period, but focus more heavily on the evolution of unemployment and productivity in the United States and abroad.

[16]Because of missing data, Japan and Italy are not included in the weighted average of foreign deficits for years prior to 1970. Note that the diagram covers only years since 1970 in order to make the time patterns of this period more discernible.

[17]Data on the deficits in each of the foreign countries are available from the author on request.

[18]In mid-1982, the Federal Reserve appears to have loosened policy, probably in response to the continuing U.S. recession and Mexico's near-default on its external debt.

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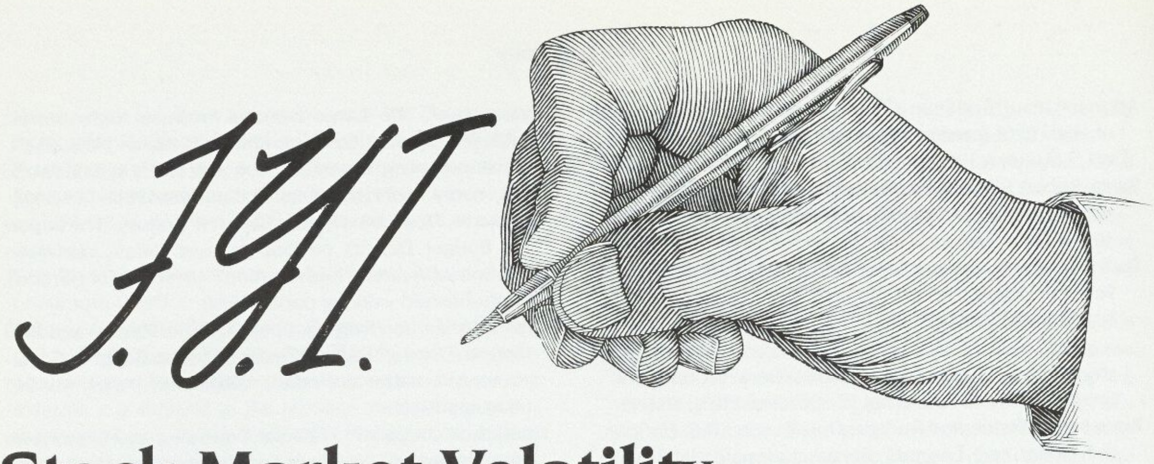

Stock Market Volatility

Steven P. Feinstein

The stock market has caused a great deal of anxiety over the last several months, and not solely due to the decline in stock prices. Concomitant with the fall came a sharp increase in stock market volatility. Prices began to plunge and skyrocket with regularity. Changes in the Dow Jones Industrial Average (Dow) that once were considered remarkable—20 points, 30 points, even 40 points—are now viewed as common and moderate. This volatility itself, regardless of whether it represents an upswing or a downswing, has become a major concern of policymakers and the public alike.

This note defines and describes stock market volatility, compares recent fluctuations with past experience, and then forecasts future volatility. Claims of elevated volatility have been made for more than a year now. What we will see, however, is that volatility, measured as one-month price swings, during the 12 months prior to October 1987 was quite average compared with the period since 1926. On the other hand, if recent volatility is compared with the last 25 years, the year ending October 1 stands out somewhat more. Additionally, we will see that, with respect to fluctuations within months, the preceding year was indeed extraordinary when viewed against the last quarter-century. The outlook for the near future is for more of the same: volatility is expected to remain high, running at more than twice its historical rate.

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Measures of Volatility

In its general sense, volatility refers to the rapidity and magnitude of change. An asset is termed volatile if its price moves by large amounts over short periods of time. Investors tend to dislike volatility in financial portfolios because greater volatility renders them less certain about their future wealth. Such uncertainty compounds the difficulty of planning how much to consume and how much to save.

Percentage Price Changes. To measure volatility, it is necessary first to measure price changes. Since our ultimate interest is volatility of the value of an investment in an asset, the price changes should be measured in percent terms rather than in dollar amounts. The percent change in a financial asset's price equals the (capital) return that would be earned or lost on an investment in that asset. Therefore, a volatility measure that reflects changes in an asset's price via percentages will at the same time indicate the volatility of the value of an investment in the observed asset. Furthermore, only when price changes are measured in this way can changes of a given asset's price at a given time be compared with changes of other assets' prices or with changes from other times. For example, to conclude that a 20-point change in the Dow Jones Industrial Average represented the same volatility in September 1987, when the Dow was at 2700, as it did in January 1981, when the level was below 1000, would be patently incorrect. A 20-point change represented only a 0.74 percent shift in the more recent period, whereas those same 20 points represented a price change of over 2 percent—or nearly three times as much—in January of 1981. Clearly, comparing volatility from two different time periods requires that the measurement of price changes be normalized, which is accomplished by relying on percentages.

Absolute Value. Since volatility refers to magnitude of change and not necessarily to its direction, it is also necessary to look at the "absolute value" of this percentage return. The absolute value of a return is the magnitude of that return, regardless of whether the return is positive or negative. It is obtained by simply dropping any negative sign from an asset's percent price change. One convenient measure of stock market volatility, then, is a time series of absolute values of returns. Such data will reveal which periods experienced large net price swings.

Standard Deviation. The absolute value of return over a period, however, will not tell us if prices fluctuated greatly within that period. Prices can fluctuate greatly within a period, satisfying our definition of volatility, and yet show only a small net price change from the beginning to the end of that period. In order to capture this type of volatility, it is necessary to divide the larger period into smaller units, and take an average of the smaller periods' price swings. The sample standard deviation, which measures the dispersion of returns within a period and thus the period's degree of price fluctuation, is the most commonly used measure for this purpose. By sorting observations of daily returns into monthly groups and then computing the sample standard deviations of the daily returns within each month, one can derive a time series of monthly standard deviations. This series will indicate those months in which prices fluctuated the most.

Comparing Volatility over Time

Both these volatility measures were computed as far back in time as data availability permitted. For the absolute values of monthly returns it was possible to construct a time series which spans the period from January 1926 through October 1987. In the case of monthly standard deviations of daily returns, each month from July 1962 through October 1987 is included. Monthly observations of the New York Stock Exchange (NYSE) composite index were used to compute the absolute values of monthly returns; daily observations of the Standard and Poor's (S&P) 500 were used to compute the monthly standard deviations.

These indexes, rather than the often cited Dow, were used for two reasons. First, unlike the Dow, the NYSE composite and the S&P 500 are value-weighted indexes. This means that the indexes' levels correspond to the actual value of *all* the outstanding shares of the companies they comprise. Second, owing to their greater diversification, they are more representative of the market as a whole than is the Dow. Because of this broader base, the indexes' volatility more truly reflects the actual volatility of the stock market. Just as an undiversified portfolio tends to be more volatile than one that is diversified, aggregates composed of few stocks exhibit greater volatility than the more comprehensive market indexes we used.

Over the period from January 1968 to October 1987, the standard deviation of daily Dow percent changes was 6 percent greater than that for S&P 500 percent changes. In the single month October 1987, the standard deviation of changes in the Dow exceeded those in the S&P 500 by 8.4 percent. These discrepancies show that observations based only on the Dow overstate true stock market volatility.

In an effort to place the past year's stock market volatility in perspective, all months in each of the two time series were ranked according to their respective degrees of volatility. For the period from January 1926 through October 1987, Table 1 shows the 20 months that exhibited the largest absolute values of returns. The returns for the 13 months up to and including October 1987 are listed in Table 2, along with each month's respective absolute return rank.

Table 1.

Twenty Months with Largest NYSE Composite Index Percent Changes, January 1926 through October 1987

Rank	Month	Percent Change
1	April 1933	37.4
2	August 1932	35.5
3	July 1932	32.4
4	September 1931	-29.3
5	March 1938	-23.9
6	June 1938	23.0
7	May 1940	-22.6
8	October 1987	-21.9
9	May 1932	-20.9
10	May 1933	20.7
11	October 1929	-19.7
12	April 1932	-18.2
13	October 1974	16.5
14	June 1930	-16.1
15	September 1939	15.5
16	April 1938	14.2
17	December 1931	-14.0
18	September 1937	-13.9
19	February 1933	-13.8
20	May 1931	-13.8

Source: The Center for Research in Security Prices, University of Chicago.

Table 2.

Monthly Returns of NYSE Composite Index and Volatility Rankings, October 1986 through October 1987

Month	Return (percent)	Volatility Ranking* Among 741 Months Since January 1926	Volatility Ranking* Among 305 Months Since July 1962
October 1986	5.1	194	65
November 1986	1.4	557	216
December 1986	-3.0	366	140
January 1987	12.6	27	4
February 1987	3.8	308	118
March 1987	2.4	429	162
April 1987	-1.8	507	197
May 1987	3.3	342	130
June 1987	4.7	227	78
July 1987	4.4	251	92
August 1987	3.3	346	133
September 1987	-2.3	453	176
October 1987	-21.9	8	1

**Months are ranked according to the absolute value of their returns.*

Source: The Center for Research in Security Prices, University of Chicago.

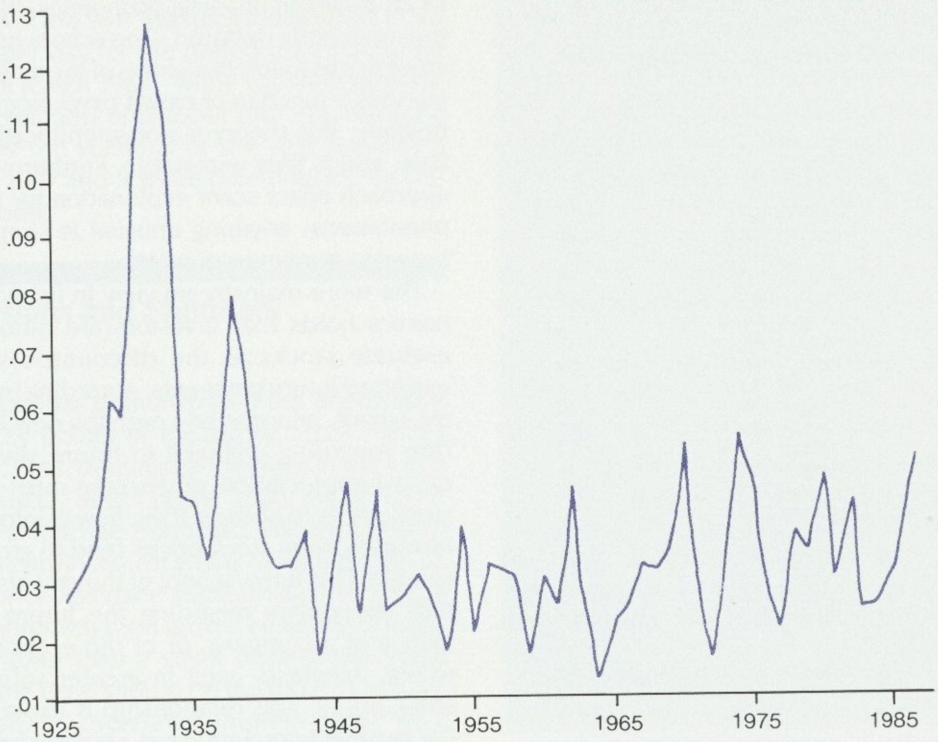
While we see that by this measure October 1987 was the eighth most volatile month since 1926, it is the only month in the last year that ranked in the top 20. In fact, in the year prior to October 1987 only one month placed in the top 25 percent, and eight of the last twelve months ranked no higher than the fifth decile from the top. By this standard, therefore, volatility in the year leading up to October 1987 was rather unremarkable compared with the historical record since 1926.

When viewed against the absolute values of monthly returns for just the last 25 years, however, the period from October 1986 through October 1987 stands out slightly more. Two factors account for this difference: the decade of the 1930s, a period of prolonged volatility, is excluded from this latter sample; and the decade of the 1960s, one of rather low volatility, constitutes a greater portion of the total span. As Table 2 indicates, on the basis of absolute value of return, October 1987 was the most volatile month in this 25-year sample, and January 1987 ranked fourth. Of the last twelve months, four—or exactly one-third—fell within the top third of volatile months since July 1962. Although eight of the last twelve months ranked above the median, seven months ranked no higher than the fifth decile from the top. Thus, two months from the last year showed unusual volatility, and the period had more than its share of months above the median. However, the last year was not overrepresented in the top third of volatile months, and most of its months were clustered near the median. Statistically, on the basis of monthly price swings, a year such as the last is not terribly striking.

The average absolute values of monthly returns for each year from 1926 to 1987 are graphed in Chart 1. (The value for 1987 is the average of the absolute values of the monthly returns for the period from November 1986 through October 1987.) The extraordinary volatility experienced during the 1930s is clearly portrayed, as is the low volatility of the 1950s and 1960s. The chart also shows how the recent years seem to be in line with the comparatively moderate experiences of the 1940s and 1970s. Even including the extreme stock market plunge of October 1987, this last year is far from being the most volatile on record, according to this measure.

Chart 1.

Annual Average Absolute Values of Monthly Returns, 1926-87*



** 1987 = November 1986 through October 1987.*

Source: The Center for Research in Security Prices, University of Chicago.

The 20 months from the period since 1962 in which the standard deviations of daily returns were greatest are presented in Table 3. The standard deviations of daily returns for the 13 months up to and including October 1987 are listed in Table 4 along with their ranks. The volatility measure in this ranking is different, as it focuses on intra-month price fluctuations. According to this measure, the last year is markedly more volatile than the preceding 25 years and October 1987 is the single most volatile month. Four months are in the top 10 percent of volatile months, eight are in the top 25 percent, and a ninth is in the top 30 percent. Ten of the last twelve months fall above the median.

Furthermore, whereas the standard deviation of S&P 500 daily returns for the entire period from July 1962 up to October 1986 was 0.8 percent per day, that for October 1986 up to October 1987 was greater, at 0.9 percent. The standard deviation of daily returns in October 1987 was 5.7 percent, more than seven times the historical norm.

Thus, compared with the overall period from July 1962 through October 1987, the recent year clearly contained an exceptional number of months with above-median standard deviations. Moreover, the standard deviation of daily returns over the 12 months through October 1987 was significantly greater than that for the rest of the period since July 1962.[1] This result is not simply due to the extremely high volatility in October 1987. Even the 12 months *prior to* October 1987 showed a standard deviation of daily returns significantly greater than the preceding period since July 1962.[2] Thus, we can conclude that the recent 13 months have indeed been a period of unusually high volatility, according to the standard deviation measure.

Table 3.

Twenty Months with Largest Standard Deviations of Daily S&P 500 Percent Changes, July 1962 through October 1987

Rank	Month	Standard Deviation (percent)
1	October 1987	5.73
2	October 1974	2.02
3	May 1970	2.00
4	September 1974	1.93
5	December 1973	1.68
6	October 1982	1.67
7	August 1982	1.67
8	November 1982	1.65
9	July 1974	1.49
10	August 1974	1.45
11	April 1987	1.45
12	March 1980	1.43
13	September 1986	1.39
14	December 1974	1.38
15	November 1973	1.36
16	November 1963	1.35
17	November 1974	1.33
18	January 1974	1.27
19	January 1975	1.27
20	January 1983	1.27

Source: The Center for Research in Security Prices, University of Chicago.

Table 4.

Standard Deviations of Daily S&P 500 Returns and Rankings, October 1986 through October 1987

Month	Standard Deviation (percent)	Ranking among 305 Months Since July 1962*
October 1986	0.63	183
November 1986	0.97	59
December 1986	0.76	121
January 1987	0.93	70
February 1987	0.86	88
March 1987	0.96	62
April 1987	1.45	11
May 1987	1.14	30
June 1987	0.68	155
July 1987	0.58	198
August 1987	0.93	71
September 1987	1.12	31
October 1987	5.73	1

** Months are ranked according to the absolute value of their returns.*

Source: The Center for Research in Security Prices, University of Chicago.

Predicting Volatility

What causes stock prices to become volatile? Of all issues in financial economics, this one is the most hotly debated. One school holds that stock prices follow the whims of the masses, and are thus a function of crowd psychology. Unfortunately, this theory is not scientifically falsifiable, and is thus untestable. Furthermore, this approach offers scant explanation for financial phenomena; anything unusual is simply attributed to human irrationality.

The more mainstream view in financial economics holds that investors are rational and evaluate stocks as the discounted value of expected future payments. According to this latter school, information—perhaps new information regarding changes in future dividends, capital appreciation, or discount rates—causes stock prices to change. If the flow of information increases, then stock prices tend to grow more volatile. This latter school of thought also holds that uncertainty regarding the future performance of a company, or of the economy as a whole, manifests itself in greater volatility of stock prices. This relationship is explained by the fact that information has a greater impact on expectations of future prospects in an environment of uncertainty than it otherwise would.

A great deal of research effort is currently being devoted toward uncovering the causes of volatility. Government commissions such as the Brady task force have joined the academicians in this endeavor. So far, with regard to the causes of the recent surge in volatility, the findings are inconclusive.[3]

Although we do not know for sure what causes volatility, there are methods that help to predict it. One makes use of the relationship between the prices of traded stock options and the stock volatility which traders forecast for the future. The purchaser of an option has the right but not the obligation to buy or sell stocks at some fixed price up until a specified future date. The more volatile a stock is, the more likely the price will move into the range that makes exercise of the option profitable. Thus, the option's current value is a function of the stock's volatility. The formula relating an option's value to volatility can therefore be used to infer a forecast for volatility from an observed option price. This implied forecast incorporates all information that bears on future volatility.[4] With this method, the prices of stock index options on January 4, 1988, implied a forecast for the daily standard deviation of the S&P 500 stock index equal to 1.8 percent per day for the period up through the middle of March 1988.[5] While substantially less than the volatility of October 1987, this measure surpasses the volatility of the year preceding October 1987 and is more than double the historical norm.

Conclusions and Summary

This note has demonstrated the importance of two key points in measuring stock market volatility. First, percentage changes in the price of a financial asset rather than dollar value changes should be examined. Failure to do so will create an illusion of greater volatility after an asset's price has risen substantially. Second, a broad value-weighted index consisting of many stocks, rather than a small unweighted index such as the Dow, should be the focus of inquiry. Otherwise, an overstated impression of stock market volatility can result.

Avoiding those two pitfalls, this study has shown that monthly price swings during the past year were, on average, not extraordinary in comparison with all other months since 1926. In fact, some past periods have exhibited even greater volatility in their monthly prices. Set within the truncated period of only the last 25 years, though, the past year stands out somewhat more. October 1987 experienced the greatest price swing in the period, but the remaining months from the past year are scattered throughout the rankings, most of them placing near the median. On the other hand, by a different measure of volatility, the past year was indeed abnormal in the 25-year perspective. The monthly standard deviations of daily returns were distinctly high over the past 12 months, and the standard deviation of daily returns for the entire year was significantly greater than that for the rest of the period.

Thus, whether or not the 12 months up to October 1987 constitute a very volatile year depends both on the volatility measure used and on the historical period for comparison. On any basis, however, October 1987 was an exceptionally volatile month. Looking ahead to the period from January 1988 through mid-March 1988, volatility is expected to remain higher than average, although lower than October's level.

The issue of volatility is increasingly attracting the attention of financial economists, which is an appropriate development. Explanations of the causes of volatility are so far quite rudimentary, and little is known about its actual costs. We do know, however, that volatility exacts costs, and so the impact of policy on market volatility deserves careful consideration.

Notes

1 The F-test of the hypothesis that this is not the case can be rejected at the 1 percent significance level.
$F_{test}(251;6114) = 5.789$,
$F_{critical}(1\%;251;6114) = 1.225$.

2 The F-test of the hypothesis that this is not the case can be rejected at the 1 percent significance level.
$F_{test}(252;6091) = 1.384$,
$F_{critical}(1\%;252;6091) = 1.224$.

3 Commodity Futures Trading Commission, "A Review of Stock Index Futures Trading on January 23, 1987" (July 1987); Securities and Exchange Commission, "The Role of Index-Related Trading in the Market Decline of September 11 and 12, 1986" (March 1987); and *Report of the Presidential Task Force on Market Mechanisms* (January 1988).

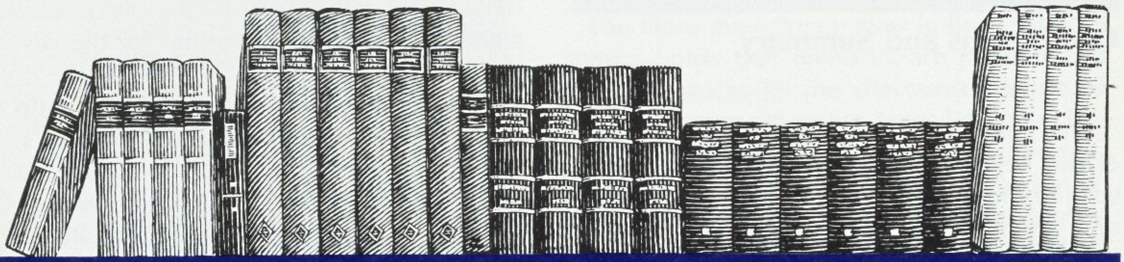
4 Although a confidence interval around the implied forecast is not readily available, studies have shown that the implied forecast is a more efficient estimator than are historically based forecasts. See Donald P. Chiras and Steven Manaster, "The Information Content of Option Prices and a Test of Market Efficiency," *Journal of Financial Economics* 6 (June/September 1978): 213-34. In this sense, then, while the implied forecast is only a general gauge of expected volatility, it is arguably the best available gauge.

5 This calculation is based on the January 4, 1988, closing price of the March 255 (at-the-money) call option on the S&P 500 stock index as reported in the *Wall Street Journal*. The volume on that day for all calls on the S&P 500 was 8,002. The volume for the March 255 contract, according to the Chicago Board Options Exchange (CBOE), was 208.

Book Review

Leadership at the Fed

by Donald F. Kettl
New Haven: Yale University Press, 1986.
218 pages. $22.50.



Donald Kettl writes that this is "a story of the Fed's power and independence told through the history of the Fed's chairmen." More precisely, *Leadership at the Fed* looks at the exercise of power in one facet of the Federal Reserve System's activities—the formulation of monetary policy—from the perspective of the chairmen's relationships with Congress and the administration. In the eyes of the author, these relationships display the basis of the Fed's power, which, in his opinion, resides in the person of its chairman. He concludes that, rather than being independent, the Fed is interdependent with the president, not only because of the obvious political impact economic issues carry but also owing to what he views as the increasing entanglement of monetary and fiscal policy over time. Kettl pursues his theses through a chronological narrative to which he appends a typology of interaction between the chairmen, on one hand, and the various presidents and Congresses, on the other.

Two themes underlie the narrative. The first, "the struggle for independence from the Treasury," occupies the period from passage of the Federal Reserve Act in 1913 to the Fed-Treasury accord of 1952. This agreement freed the Fed from its obligations to support Treasury security offerings at artificially low, "pegged" rates of interest and allowed monetary policy to be conducted at the Fed's discretion. The second, related theme is the ambiguous one of the Fed's accountability in light of its post-accord monetary policy discretion. The theme appears in the search for an acceptable method for communicating the intention of monetary policy to congressional representatives and presidents, who, Kettl notes, tended to have the layman's understanding of economic concepts and the politician's passion for easy money.

Kettl gives short shrift to the System's first two decades, which span the tenures of seven Fed governors, as the chiefs of the Fed were known prior to 1935. During that early period, the secretary of the Treasury, along with the comptroller of the currency, had a seat on the Fed Board and, according to Kettl, effectively headed up the Fed. If there is a basis for this opinion, it is not consistently presented. In fact, the author seemingly contradicts himself by his treatment of events in the 1920s. Kettl opines that the Fed leadership was "immobilized" at that time by the necessity of supporting the Treasury's financing of the First World War. Nonetheless, when he narrates the Fed's ensuing post-armistice "mistakes"—moving too slowly in early 1920 to boost interest rates in the face of inflation and then again too slowly to decrease rates in 1921 as the economy sharply declined—the Treasury's guiding hand is either invisible or absent. Kettl provides only fleeting glimpses of the thought process within the Fed's leadership to support his belief that "neither the Fed nor anyone else understood the dynamics of inflation and recession." The same neglect of connective tissue holds for the apparent abdication of power in the mid-1920s by successive governors Daniel Crissinger and Roy Young to Benjamin Strong, head of the New York Fed, whom the author credits with the "discovery of economic management" during the recession of 1923. Having been conditioned by this point to regard the Treasury as running the Fed, the reader is left to wonder whether the Treasury secretary, too, surrendered authority to Strong during this interlude.

Kettl's real interest in Fed leadership begins with Marriner Eccles, the first leader to hold the title "chairman." Eccles's personality and leadership style are treated with considerably more depth than those of his predecessors, as are the details of his relationship to President Franklin Roosevelt. Although Eccles lacked formal training in economics, he had creative ideas regarding economic policy and bank regulation. Under his guidance, the Federal Open Market Committee (FOMC) became prominent in the conduct of monetary policy and the Fed gained political independence. The latter was achieved through the departure of the treasurer and comptroller from the Board of Governors under the terms of the Banking Act of 1935.

However, Kettl contends that these accomplishments were implemented at first more through the political acumen of Roosevelt than through the efforts of Eccles, who was hampered by his want of political finesse. Moreover, while the reforms associated with Eccles led on the one hand to greater independence from the Treasury Department, on the other hand they resulted in closer coordination between the Fed's monetary policy and the administration's fiscal policy than at any previous point in the System's history. This linkage occurred, Kettl writes, both because centralizing open market operations in Washington had removed individual discretion from the Reserve Banks and because Eccles—"a Keynesian who had never heard of Keynes"—was so closely aligned with Roosevelt's ideology.

Eccles becomes Kettl's prototype for a threefold categorization of Fed chairmen in their relationship with their chief "constituent," the president. Only Eccles and William McChesney Martin fall into all three classes—accommodation, confrontation, and transformation. The author notes that "despite the vast quantity of writing about the Fed's independence, the most notable fact about the Fed is that only rarely have the president and the chairmen been far out of step." During 37 of the 52 years between 1934 and 1985—or "71 percent of the time" in Kettl's rather overexact computation—chairmen have tended to accommodate the president. "The job of the chairman during these years fundamentally was seeking to meet the presidents' overall economic goals," he writes. For example, during the New Deal and World War II, Chairman Eccles "enthusiastically delivered the policies that Roosevelt wanted."

In only six years of the survey period were chairmen in confrontation with presidents by Kettl's standards. These occurred during the peg controversies of 1945-48 and 1949-51 and the Lyndon Johnson-Chairman Martin dispute of 1965-66. In each of these cases, war put heavy demands on the economy, and Presidents Truman and Johnson pressured chairmen to keep interest rates low at times when the Fed was concerned about arresting inflation. Among the nine years of transformation, which is his third category, Kettl includes 1934-35, the period around passage of the Banking Act; 1951-56, when Martin practiced his strategy of "leaning against the wind;" and Paul Volcker's "experiment with monetarism" in 1979-82. During these years, the author believes Fed chairmen moved to alter the basic relationship with the president.

Eccles is said to have pioneered the transformation mode during negotiations over the Banking Act of 1935, even though he is mostly characterized as having been accommodative to Roosevelt. There were confrontations during this period as well. As Kettl points out, Eccles particularly sparred with Roosevelt's Treasury secretary, Henry Morgenthau, who in 1936 established his own vehicle for conducting open market operations by selling 90-day Treasury bills and using the proceeds to buy and hold gold. Through this effort to hold rates steady, which was christened a "sterilization" plan, the secretary hoped to soak up the gold that was flowing into America and threatening to put upward pressure on interest rates. In doing this, Morgenthau side-stepped Eccles's effort to tighten monetary policy by raising reserve requirements. Although the Treasury chief's action received the president's support, Kettl still sets Eccles within the basic pattern of accommodation vis-a-vis Roosevelt. As Eccles's period of confrontation, he points to the 1945-48 controversy over the Treasury peg—a conflict identified with the Truman administration. Eccles's protracted postwar campaign against pegging so rankled Truman that the latter refused to reappoint Eccles to the chairmanship.

With Kettl's analysis of Eccles, one encounters a conceptual problem that haunts his characterization of succeeding chairmen. If we are to accept Kettl's periodization, we are forced to agree that in times of "accommodation" the chairman's actions are guided by his sense of what the president desires, or at least by the weight of the president's power brought to bear on a given situation, rather than by a parallel reading of what steps are necessary to achieve economic goals. The fact that there are identifiable periods of confrontation during the half-century Kettl reviews would seem to suggest, however, that while monetary and fiscal policymakers tended to agree on the economy's needs, at times their interests distinctly diverged because of the nature of their responsibilities. At such moments of stress, notably during wartime, presidents no doubt understood the Fed's rationale on some level but had a broader set of policy mandates to weigh. By the same token, during those longer "accommodative" spans, Fed chairmen may simply have been reacting to the same economic data in the same way as the presidents, rather than bowing to the chiefs of state. Kettl would have to present more overt proof of conscious accommodation to be convincing.

Kettl next turns to Thomas McCabe, Eccles's successor, whom he classes as a weak leader very much in Eccles's shadow. Despite his loss of the chairmanship, Eccles remained on the Board, as did a number of Board members whose candidacy he had supported. McCabe was thus alone and without support for his strategy of acting as a mediator in the effort "to transform the Fed's decade-old ties with the Treasury by backing away from the peg as gradually as possible." Although this approach was "a complete failure," Kettl characterizes the McCabe chairmanship as one in which the Fed pursued the very independent and controversial course of maintaining restrictive monetary policy to combat double-digit inflation despite the Treasury's demands for low interest rates to finance the Korean War. Leadership was being exercised at the Fed, but we are left to wonder by whom. One might have learned more about the tenor of internal Fed politics had Kettl carefully analyzed the voting on Board decisions or offered fuller disclosures from his store of anecdotal information.

The peg conflict of 1949-51 resulted in the accord hammered out between Treasury and Fed officials and McCabe's resignation shortly afterwards, an event that led some observers to speculate this was part of the deal. The author does not resolve the question. McCabe was replaced by William McChesney Martin, who had represented the Treasury in working out the accord. Unlike McCabe, Martin was able to transform the Fed through a strategy he called "leaning against the wind"—using the Fed's monetary policy tools to set policies counter to economic disturbances. From the mid-Eisenhower era in 1956 through 1965, Kettl sees Martin as accommodative. Eisenhower made it clear that he supported Fed independence, while Martin for his part participated in regular conversations with officials from the Council of Economic Advisors and the Treasury—particularly in a foursome called the "Quadriad"—to discuss policy options.

"The fact that there are identifiable periods of confrontation . . . would seem to suggest . . . that while monetary and fiscal policymakers tended to agree on the economy's needs, at times their interests distinctly diverged because of the nature of their responsibilities."

In the Kennedy administration, this arrangement led to what Kettl presents as a cooperative venture called "operation twist." At the Administration's behest, the Fed shifted its attention to long bonds from short-term securities like Treasury bills in order to stimulate long-term investment. The idea behind the "twist" was to keep long-term interest rates low by artificially increasing demand for bonds. Economists tend to doubt that such a policy can effectively hold long-term rates lower than they would otherwise be, and Kettl leaves the issue without assessing whether the "twist" actually worked. It is noteworthy that all the author's supporting sources for his argument that Martin buckled under to the Administration's plan are taken from administration papers, particularly those of Walter Heller. Martin, Kettl tells us, studiously avoided officially endorsing the plan and "simply presented changes in the Fed's buying habits as shifts in operating policy rather than explicit coordination with the Administration." Again, evidence of accommodation on the chairman's part is largely circumstantial.

"[From a] correlation between the number of bills introduced per year and the level of interest rates . . . [Kettl] concludes that Congress's interest in the Fed tends to increase with interest rates."

Cooperation turned to confrontation in the Johnson administration, however, as the Fed under Martin allowed upward pressure on interest rates in the face of the Vietnam War. Nonetheless, because Martin had been able to accommodate most presidential policies while nurturing the public image of independence, he could "establish the institutional base for ongoing cooperation with the president in a way that did not diminish (and even enhanced) the Fed's power." This legacy has lasted to the present, in the author's opinion.

Arthur Burns is clearly the Fed leader the author most enjoyed writing about. Burns belongs to Kettl's camp of "accommodative" chairmen, with the qualification "but often in confrontational style." Indeed, his confrontations with Richard Nixon make for some of the most entertaining passages in the book. For the period of Burns's leadership, Kettl begins to concentrate on his second theme—the Fed's accountability for monetary policy. This issue arose once the Fed alone became responsible for its actions in the wake of the 1952 accord granting it independence from the Treasury. The will of Congress to impose some controls on the Fed mounted during Burns's chairmanship. The preceding two decades had been relatively quiet, except for occasional attacks from the likes of Congressman Wright Patman, who believed that the Fed was "a secret club operated for the benefit of bankers," in Kettl's words. This opposition had come from such extreme quarters that the Fed was able to defuse it, but such was not the case under Burns. In part, Kettl attempts to explain this growth in congressional interest by a graphic correlation between the number of bills introduced per year and the level of interest rates—a measure of his own invention. From this measure he concludes that Congress's interest in the Fed tends to increase with interest rates. Since interest rates rose appreciably from the late sixties through to the eighties, Kettl sees a gathering storm of protest which generated a spate of bills demanding greater accountability from the Fed.

It fell to Burns to battle Congress over the accountability issue, and Kettl suggests it was a task the chairman relished. As the anecdote describing Burns's preparation for a congressional hearing by shadow boxing suggests, his relationship with the legislative branch was anything but accommodative. The Fed fought and won a continuing battle led by Patman and others to force immediate disclosure of monetary policy deliberations and pulled out all the stops to lobby unsuccessfully against a bill authorizing audits of the Fed by the Government Accounting Office. Senator Henry Reuss spearheaded a concerted congressional effort to force the Fed to publish monetary targets once he adopted the monetarist doctrine that central bank policy should be guided by a rule. (The Fed had rejected this monetarist approach from the time that it first was urged in the 1930s.) The senator's concept was to set explicit interest rate targets for the Fed and establish a deadline for meeting them, thereby limiting the Fed's discretion. Kettl writes that Burns believed no single economic measure, interest rates in particular, was "adequate to describe the condition of money and credit." He successfully negotiated to let the Fed establish a range for a measure of his own preference—monetary aggregates like M1 and M2. In 1978, reporting of those monetary targets was formalized by the Humphrey-Hawkins provision calling for twice-yearly reports to Congress that would explain the Fed's goals vis-a-vis the administration's fiscal program. Kettl regards Burns's choice of indicators as providing vehicles of accountability that were vague enough to preserve the Fed's flexibility and "blunt the most threatening congressional tactics." He describes M1, M2, and so forth as "shields" and "technical jargon . . . that befuddled most members of Congress."

After a brief period in which Fed Chairman William Miller is shown to have failed both in his attempts to deal with inflation and "impose a corporate model on a collegial board," Kettl tells us the "shield of flexibility" was wielded with renewed skills by Paul Volcker. Because of his experiment with monetarism in the battle against inflationary forces, Volcker's chairmanship wins a listing under the rubric of "transformation." Volcker accomplished a transformation in the Fed's relations with the administration by using "the theoretical weapons of the Fed's sharpest critics as a shield behind which to increase interest rates, and when congressional attack made continued tight money politically impossible, he skillfully backed away from the monetarist prescription while leaving everyone uncertain about just what he had done." That is, by focusing attention on control of the money supply as a tool for defeating the inflation mentality into which the nation had fallen—a tactic that was abandoned, according to Kettl, in favor of a more blatantly discretionary approach when M1 ceased to behave in proper monetarist fashion—Volcker was able to give monetary policy unprecedented prominence in the political arena.

Despite the author's assertion that "congressional attack" caused the Fed to back away from its tight money strategy, he writes elsewhere that "FOMC members had decided that continuing to follow the M1 targets would produce interest rates that were too high and economic growth that was too slow." Kettl offers a reconstruction of the FOMC's thought process that points less to political pressures for changing course than to concern over the distorting effect of the newly introduced negotiable order of withdrawal (NOW) accounts on M1. When interest rates descended in early 1982, people began using these interest-bearing transactions accounts as much for savings as check-writing purposes, which rendered NOW accounts less liquid forms of money and, hence, less what M1 was designed to measure. Late in that year, Volcker announced that the Fed would de-emphasize M1 and focus on M2 and M3, a move that Kettl says allowed the Fed to ease money without appearing to back away from its war on inflation. Even though his intention is to show the Fed deferring to Congress, the information Kettl presents supports an equally plausible case for easing as the most prudent decision given current economic conditions. As with Eccles's

"Even though his intention is to show the Fed deferring to Congress, the information Kettl presents supports an equally plausible case for easing as the most prudent decision given current economic conditions."

"accommodation," a careful reader must question whether politics or economics was the underlying dynamic in the Fed's actions.

The author concludes by discussing the Fed's various constituencies and rationalizing his choice of the president as the Fed's chief constituent. As noted at the outset, he sees the Fed's independence as a function of the chairman's relationship with presidents, who are viewed as more (Truman and Nixon, for example) or less (Eisenhower and Reagan) concerned with the Fed's activities. The chief executives' constituent role has grown more pronounced over time because, Kettl believes, they have become increasingly dependent on monetary policy. By the late 1960s the budgetary process had become inflexible to the point that later administrations have been forced to fall back upon the Fed's influence over the supply of money and bank credit to fulfill their campaign promises to boost employment and economic growth. In addition, the internationalization of economic issues, specifically the debt of less-developed countries and the U.S. trade deficit in the 1980s, made Fed actions of key significance to the administration's efforts in international relations.

With his issues of the Fed's power base and its independence thus decided to his apparent satisfaction, Kettl turns to summarizing the accountability question: "Is the Fed—as a powerful, legally independent agency—accountable?" He delivers no final answer, stating instead that "real accountability for economic policy has become hidden increasingly in a subterranean system in which elected officials can remove their fingerprints from politically dangerous policies they implicitly support." Kettl is closest to responding to his rhetorical question when discussing the Fed's decision to ease monetary policy in late 1982. At the same time, it abandoned M1 as an intermediate target in favor of broader monetary aggregates. He describes Volcker's November 1982 (the text misprints 1979) testimony to the Joint Economic Committee as a "masterpiece of Fedspeak. . . . The ambiguity of Volcker's remarks quite intentionally left his listeners uncertain about what the Fed would do next. The message of easier money and lower interest rates, however, was unmistakable."

"Overall, Leadership at the Fed has two major weaknesses. One is . . . that the work becomes for the most part one-dimensional. The second is the author's inability to come to grips with the issue of the Fed's accountability. . . ."

Whether the chairman's intention was in fact to create uncertainty, the example helps to define the root problem of accountability, that is, the difficulty of attaining consensus on how the goals expressed in the often abstract vocabulary of macropolicy should be achieved. As Kettl intimates, at the macro level everyone—congressmen, presidents, and Fed chairmen alike—agrees on the ultimate policy outcomes of gross national product (GNP) growth accompanied by low levels of unemployment and inflation. The challenge is to reach agreement upon the tradeoffs that efforts to attain those goals entail. Inflation can be lessened, but it might cost an economic slowdown and higher unemployment; the budget deficit can be cut, but only at the expense of higher taxes or reduced services. In this environment, *all* policymakers hesitate to specify how they propose to capture their goals, either for fear of voter dissatisfaction on the part of elected officials or in the interest of avoiding market disruptions on the Fed's part. Given these restraints, it is somewhat misleading to concentrate as Kettl does on "Fedspeak," with its implication of deliberate disinformation, unless a comparable exploration of the verbal maneuverings resorted to by congressmen and administration officials is offered.

Overall, *Leadership at the Fed* has two major weaknesses. One is a focus so narrow—confined to the Fed's monetary policy prerogatives and the chairman's part in effecting them—that the work becomes for the most part one-dimensional. The second is the author's inability to come to grips with the issue of the Fed's accountability, ostensibly the book's underlying purpose. Kettl's restricted scope brings selected events to the fore without providing sharp contrasts against which to view them. In particular, the historical context is a casualty. With the struggle for release from Treasury domination as one of his main themes, for example, the author could offer background by explaining that the Treasury in effect served as central bank before the Fed was established. Aside from overseeing the national banking system, the issuance of currency, and international flows of gold, Treasury officials occasionally conducted open market operations very much like those the Fed would later carry out. Lacking this knowledge, a reader who learns that during World War I "some shrewd Fed officials realized that buying or selling government securities as part of the Treasury's support program could also help speed up or slow down the economy" would erroneously infer that no precedent existed for this crucial tactic of monetary policy.

Kettl's book is further marred by a lack of supporting detail for events parallel in time to his recounting of the chairmen's actions. In the story of the Fed's early days we are given the feeling, quite correctly, that international gold flows had considerable impact on the domestic economy. Much is made, for example, of Benjamin Strong's 1927 discussions with Montagu Norman of the Bank of England on Europe's gold drain. However, we are not apprised of the abandonment of the gold standard by many countries and the concurrent nationalization of gold in the United States in the 1930s, nor of the Bretton Woods agreement, which established a system of pegged exchange rates after World War II, nor even of the move to floating exchange rates during the Nixon administration in 1972. The latter, in particular, has had major implications for monetary policy in this decade and added a new constituency—the world outside our borders, no less—to the Fed's list.

One-dimensionality also distorts the picture of the Fed and its operations that emerges from the text. Monetary policy formation is but one of the Fed's powers, and it is supported by the mandate to supervise and regulate the commercial banking industry. The importance of that aspect of Federal Reserve workings was demonstrated in the events leading to the passage of the Depository Institutions Deregulation and Monetary Control Act of 1980 (DIDMCA 80), which required the Fed to price services competitively and deal with a host of fundamental institutional changes. Working out the details of the legislation required leadership and political skills of similar subtlety to those demanded in the formation of monetary policy. Furthermore, adjusting to the bill's effects, particularly the mandate to price services that had formerly been provided free to member institutions and thereby to enter the competitive market for those services, has changed the entire fabric of the System. Astonishingly, DIDMCA 80 is not discussed in Kettl's book. The reader is forced to ask whether this omission, along with the general neglect of the Board's relations with the banking industry, occurs because it complicates Kettl's simplistic view of the chairman as the Fed's sole leader of importance. Whatever the reason, flaws such as these seriously impair Kettl's credibility, further weakening already suspect conclusions.

Concentration on so narrow a band of information would not be deleterious if it led to attainment of the researcher's objectives, in this case an understanding of the Fed's independence and accountability. As already noted, however, Kettl leaves accountability "hidden . . . in a subterranean system." Perhaps he would have done better to look more thoroughly outside the boundaries formed by his basic premise. Because of the weight he assigns to actions of chairmen and presidents, Kettl tends to seek out the drama of interpersonal struggle over the reality of institutions confronting the impersonal forces of the macroeconomy. A more balanced approach would be to argue that, in terms of monetary policy, the Fed's accountability is to the economy itself, to all the people who participate in it, and to the capital markets, rather than to the few in government circles whose opinions are most visible. The economic indicators—gross national product, unemployment, inflation, dollar exchange rates—are the standards by which monetary policy is judged daily in the markets, which will not long brook overly expansive or restrictive actions without equal and opposite reactions. If a given chairman appears accommodative or confrontational vis-a-vis the president, it is likely because the FOMC's united judgment of the direction in which the numbers seem to be moving agrees or disagrees at best with the assessment of that administration's economists, at worst with the self-serving requirements of politicians facing election.

It was, of course, to distance the Fed from political considerations in policy formation that its structure has been shaped as it is by legislation over the years. From Alexander Hamilton to the present, political leaders and theorists have recognized the inherent conflict of interest in government control of both monetary and fiscal policy. As frustrating as the Fed's independence may at times be to legislators, it is probably in accord with this conflict-of-interest belief that Congress—which created the Federal Reserve System in the first place—has consistently backed away from forcing clearly defined standards of accountability on the Fed. Given this aversion, addressing the question of power and independence that Kettl sets out to explore is beset with extreme difficulties. Independence, it would seem, is inversely related to accountability, and the legislative branch has chosen for the most part to maintain the Fed's latitude. By assuming that the Fed's independence is a function of the chairman's relationship with the president, Kettl implicitly throws much of the Fed's accountability to the executive branch as well, where it belongs neither in the Fed's design nor in practice. Thus, while applauding Kettl's effort to bring the perspective of political science to bear on issues of great importance, one must also conclude that the most critical questions he raises remain unanswered, awaiting a more penetrating examination.

Larry J. Schulz

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FINANCE

IMPORTANT MESSAGE FOR DATA USERS

In June of each year, changes are made to the deposit and reserve requirement criteria used to select institutions for inclusion in the sample on which these data are based. As of September 1986, current and previous monthly data are from institutions with over $26.8 million in deposits and $2.6 million of reserve requirements. Previously, data were based on a different sample of institutions. For publication purposes, monthly year-ago computations are made on the basis of these **current reporting criteria**. Therefore, they are not entirely comparable to or consistent with previously published data covering the past periods. Moreover, percent changes shown do not control for the sample change. Data users needing further detail should contact Cheryl Cornish, Database Coordinator, 404-521-8816.

$ millions

	DEC. 1987	NOV. 1987	DEC. 1986	ANN. % CHG.		DEC. 1987	NOV. 1987	DEC. 1986	ANN. % CHG.
UNITED STATES									
Commercial Bank Deposits	1,756,169	1,740,805	1,647,747	+ 7	S&Ls Total Deposits	698,388	692,301	628,435	+11
Demand	363,399	368,595	367,426	- 1	NOW	34,715	33,620	31,696	+10
NOW	163,811	158,577	142,938	+15	Savings	149,900	153,561	150,451	- 0
Savings	510,238	509,086	499,073	+ 2	Time	511,106	502,079	443,016	+15
Time	754,408	746,410	674,036	+12	Credit Union Deposits	70,253	70,012	52,235	+34
					Share Drafts	9,539	9,178	7,500	+27
					Savings & Time	59,603	59,388	43,455	+37
SOUTHEAST									
Commercial Bank Deposits	211,676	208,413	193,621	+ 9	S&Ls Total Deposits	86,090	86,163	82,604	+ 4
Demand	41,927	40,117	41,283	+ 2	NOW	5,353	5,179	5,138	+ 4
NOW	22,887	22,075	19,651	+16	Savings	17,889	18,624	19,342	- 8
Savings	57,354	57,167	55,747	+ 3	Time	62,219	61,668	57,492	+ 8
Time	94,008	93,153	81,329	+16	Credit Union Deposits	7,638	7,622	5,675	+35
					Share Drafts	947	912	684	+38
					Savings & Time	6,329	6,312	4,647	+36
ALABAMA									
Commercial Bank Deposits	21,332	21,277	19,402	+10	S&Ls Total Deposits	4,196	4,167	4,651	-10
Demand	4,145	4,096	4,217	- 2	NOW	241	232	281	-14
NOW	2,333	2,289	1,935	+21	Savings	855	818	943	- 9
Savings	4,725	4,681	4,231	+12	Time	3,124	3,144	3,428	- 9
Time	10,579	10,657	9,450	+12	Credit Union Deposits	979	995	882	+11
					Share Drafts	142	137	150	- 5
					Savings & Time	820	816	730	+12
FLORIDA									
Commercial Bank Deposits	83,761	81,689	74,539	+12	S&Ls Total Deposits	55,503	55,763	56,439	- 2
Demand	16,378	15,189	16,079	+ 2	NOW	3,409	3,275	3,363	+ 1
NOW	10,406	9,928	8,774	+19	Savings	12,026	12,697	13,858	-12
Savings	27,117	27,067	25,853	+ 5	Time	39,500	39,155	38,655	+ 2
Time	31,694	31,081	25,800	+23	Credit Union Deposits	4,028	4,001	3,092	+30
					Share Drafts	510	486	359	+42
					Savings & Time	3,182	3,182	2,410	+32
GEORGIA									
Commercial Bank Deposits	34,257	33,874	30,779	+11	S&Ls Total Deposits	7,456	7,427	6,560	+14
Demand	8,757	8,597	8,477	+ 3	NOW	816	817	715	+14
NOW	3,257	3,167	2,787	+17	Savings	1,459	1,484	1,414	+ 3
Savings	8,922	8,839	8,894	+ 0	Time	5,219	5,143	4,464	+17
Time	14,881	14,777	12,023	+24	Credit Union Deposits	1,449	1,462	1,046	+39
					Share Drafts	163	159	103	+58
					Savings & Time	1,283	1,273	936	+37
LOUISIANA									
Commercial Bank Deposits	27,895	27,631	27,872	+ 0	S&Ls Total Deposits	10,292	10,262	7,962	+29
Demand	5,079	4,902	5,129	- 1	NOW	402	388	343	+17
NOW	2,309	2,220	2,047	+13	Savings	2,085	2,120	1,803	+16
Savings	7,929	7,916	7,866	+ 1	Time	7,793	7,743	5,806	+34
Time	13,006	12,980	13,237	- 2	Credit Union Deposits	*	*	*	
					Share Drafts	*	*	*	
					Savings & Time	*	*	*	
MISSISSIPPI									
Commercial Bank Deposits	14,465	14,321	13,509	+ 7	S&Ls Total Deposits	1,763	1,735	976	+81
Demand	2,377	2,299	2,368	+ 0	NOW	95	90	118	-19
NOW	1,421	1,415	1,226	+16	Savings	235	243	122	+93
Savings	2,872	2,869	3,017	- 5	Time	1,312	1,298	672	+95
Time	8,034	7,969	7,158	+12	Credit Union Deposits	*	*	*	
					Share Drafts	*	*	*	
					Savings & Time	*	*	*	
TENNESSEE									
Commercial Bank Deposits	29,966	29,621	27,520	+ 9	S&Ls Total Deposits	6,880	6,809	6,016	+14
Demand	5,191	5,034	5,013	+ 4	NOW	390	377	318	+23
NOW	3,161	3,056	2,882	+10	Savings	1,229	1,262	1,202	+ 2
Savings	5,789	5,795	5,886	- 2	Time	5,271	5,185	4,467	+18
Time	15,814	15,689	13,661	+16	Credit Union Deposits	1,182	1,164	655	+80
					Share Drafts	132	130	72	+83
					Savings & Time	1,044	1,041	571	+83

Notes: All deposit data are extracted from the Federal Reserve Report of Transaction Accounts, other Deposits and Vault Cash (FR2900), and are reported for the average of the week ending the 1st Monday of the month. Most recent data, reported by institutions with over $28.6 million in deposits and $2.9 million of reserve requirements as of June 1987, represents 95% of deposits in the six state area. The major differences between this report and the "call report" are size, the treatment of interbank deposits, and the treatment of float. The total deposit data generated from the Report of Transaction Accounts eliminates interbank deposits by reporting the net of deposits "due to" and "due from" other depository institutions. The Report of Transaction Accounts subtracts cash in process of collection from demand deposits, while the call report does not. The Southeast data represent the total of the six states. Subcategories were chosen on a selective basis and do not add to total.
* = fewer than four institutions reporting.

EMPLOYMENT

	NOV 1987	OCT 1987	NOV 1986	ANN. % CHG		NOV 1987	OCT 1987	NOV 1986	ANN. % CHG
UNITED STATES									
Civilian Labor Force - thous.	120,611	120,744	118,623	+ 2	Nonfarm Employment - thous.	104,095	103,773	101,234	+ 3
Total Employed - thous.	113,809	113,898	110,751	+ 3	Manufacturing	19,382	19,352	19,014	+ 2
Total Unemployed - thous.	6,802	6,845	7,872	-14	Construction	5,210	5,311	5,143	+ 1
Unemployment Rate - % SA	5.9	6.0	6.9		Trade	24,526	24,316	24,018	+ 2
Insured Unemployment - thous.	N.A.	N.A.	N.A.		Government	17,592	17,412	17,234	+ 2
Insured Unempl. Rate - %	N.A.	N.A.	N.A.		Services	24,499	24,506	23,452	+ 4
Mfg. Avg. Wkly. Hours	41.4	41.3	41.0	+ 1	Fin., Ins. & Real Est.	6,635	6,630	6,397	+ 4
Mfg. Avg. Wkly. Earn. - $	414	411	401	+ 3	Trans., Com. & Pub. Util.	5,485	5,477	5,305	+ 3
SOUTHEAST									
Civilian Labor Force - thous.	16,426	16,530	16,109	+ 2	Nonfarm Employment - thous.	11,569	11,510	11,271	+ 3
Total Employed - thous.	15,368	15,489	14,857	+ 3	Manufacturing	2,376	2,369	2,324	+ 1
Total Unemployed - thous.	1,058	1,040	1,252	-16	Construction	806	811	797	+ 1
Unemployment Rate - % SA	6.7	6.6	8.1		Trade	3,424	3,386	3,329	+ 3
Insured Unemployment - thous.	N.A.	N.A.	N.A.		Government	2,384	2,372	2,317	+ 3
Insured Unempl. Rate - %	N.A.	N.A.	N.A.		Services	2,980	2,971	2,872	+ 4
Mfg. Avg. Wkly. Hours	41.6	41.6	41.3	+ 1	Fin., Ins. & Real Est.	798	799	779	+ 2
Mfg. Avg. Wkly. Earn. - $	365	364	357	+ 2	Trans., Com. & Pub. Util.	746	746	727	+ 3
ALABAMA									
Civilian Labor Force - thous.	1,913	1,930	1,899	+ 1	Nonfarm Employment - thous.	1,503	1,503	1,473	+ 2
Total Employed - thous.	1,782	1,796	1,717	+ 4	Manufacturing	364	364	356	+ 2
Total Unemployed - thous.	131	134	182	-28	Construction	76	78	76	0
Unemployment Rate - % SA	7.2	6.6	10.1		Trade	336	333	329	+ 2
Insured Unemployment - thous.	N.A.	N.A.	N.A.		Government	303	302	298	+ 2
Insured Unempl. Rate - %	N.A.	N.A.	N.A.		Services	271	272	261	+ 4
Mfg. Avg. Wkly. Hours	41.7	41.7	41.1	+ 1	Fin., Ins. & Real Est.	70	70	70	0
Mfg. Avg. Wkly. Earn. - $	368	367	356	+ 3	Trans., Com. & Pub. Util.	71	72	71	0
FLORIDA									
Civilian Labor Force - thous.	5,929	1,930	1,899	+ 1	Nonfarm Employment - thous.	4,898	4,843	4,689	+ 4
Total Employed - thous.	5,626	1,796	1,717	+ 4	Manufacturing	532	528	521	+ 2
Total Unemployed - thous.	303	134	182	-28	Construction	347	346	343	+ 2
Unemployment Rate - % SA	5.2	4.7	5.6		Trade	1,347	1,320	1,274	+ 6
Insured Unemployment - thous.	N.A.	N.A.	N.A.		Government	757	748	718	+ 5
Insured Unempl. Rate - %	N.A.	N.A.	N.A.		Services	1,291	1,279	1,228	+ 5
Mfg. Avg. Wkly. Hours	41.0	40.4	41.1	- 0	Fin., Ins. & Real Est.	359	358	347	+ 3
Mfg. Avg. Wkly. Earn. - $	338	330	333	+ 1	Trans., Com. & Pub. Util.	254	253	248	+ 2
GEORGIA									
Civilian Labor Force - thous.	3,067	3,085	3,029	+ 4	Nonfarm Employment - thous.	2,778	2,775	2,735	+ 2
Total Employed - thous.	2,900	2,927	2,857	+ 5	Manufacturing	575	573	567	+ 1
Total Unemployed - thous.	166	158	173	- 4	Construction	160	160	164	+ 2
Unemployment Rate - % SA	5.6	5.5	5.9		Trade	702	700	693	+ 1
Insured Unemployment - thous.	N.A.	N.A.	N.A.		Government	472	471	457	+ 3
Insured Unempl. Rate - %	N.A.	N.A.	N.A.		Services	538	540	522	+ 3
Mfg. Avg. Wkly. Hours	42.0	42.6	41.2	+ 2	Fin., Ins. & Real Est.	150	150	149	+ 1
Mfg. Avg. Wkly. Earn. - $	355	359	344	+ 3	Trans., Com. & Pub. Util.	172	172	168	+ 2
LOUISIANA									
Civilian Labor Force - thous.	1,973	1,995	1,981	- 0	Nonfarm Employment - thous.	1,511	1,511	1,514	- 1
Total Employed - thous.	1,766	1,790	1,715	+ 3	Manufacturing	172	172	167	+ 3
Total Unemployed - thous.	207	204	199	+ 4	Construction	85	86	88	- 3
Unemployment Rate - % SA	11.0	10.9	14.1		Trade	362	361	368	- 2
Insured Unemployment - thous.	N.A.	N.A.	N.A.		Government	318	318	323	- 2
Insured Unempl. Rate - %	N.A.	N.A.	N.A.		Services	323	323	318	+ 2
Mfg. Avg. Wkly. Hours	42.1	42.3	42.5	- 0	Fin., Ins. & Real Est.	83	88	85	- 2
Mfg. Avg. Wkly. Earn. - $	447	455	449	- 0	Trans., Com. & Pub. Util.	107	108	106	+ 1
MISSISSIPPI									
Civilian Labor Force - thous.	1,168	1,178	1,168	0	Nonfarm Employment - thous.	879	878	860	+ 2
Total Employed - thous.	1,058	1,069	1,037	+ 2	Manufacturing	228	227	223	+ 2
Total Unemployed - thous.	110	108	131	-16	Construction	36	36	36	0
Unemployment Rate - % SA	10.2	10.2	12.4		Trade	191	189	187	+ 2
Insured Unemployment - thous.	N.A.	N.A.	N.A.		Government	199	198	194	+ 3
Insured Unempl. Rate - %	N.A.	N.A.	N.A.		Services	140	140	136	+ 3
Mfg. Avg. Wkly. Hours	40.7	40.7	40.1	+ 1	Fin., Ins. & Real Est.	39	39	38	+ 3
Mfg. Avg. Wkly. Earn. - $	311	309	301	+ 3	Trans., Com. & Pub. Util.	40	41	40	0
TENNESSEE									
Civilian Labor Force - thous.	2,376	2,381	2,339	+ 2	Nonfarm Employment - thous.	2,050	2,048	1,981	+ 3
Total Employed - thous.	2,235	2,242	2,158	+ 4	Manufacturing	505	505	489	+ 3
Total Unemployed - thous.	141	139	181	-22	Construction	102	103	90	+13
Unemployment Rate - % SA	6.4	6.7	6.2		Trade	486	483	479	+ 1
Insured Unemployment - thous.	N.A.	N.A.	N.A.		Government	335	334	327	+ 2
Insured Unempl. Rate - %	N.A.	N.A.	N.A.		Services	418	418	406	+ 3
Mfg. Avg. Wkly. Hours	42.2	41.8	41.8	+ 2	Fin., Ins. & Real Est.	97	98	91	+ 7
Mfg. Avg. Wkly. Earn. - $	370	365	359	+ 3	Trans., Com. & Pub. Util.	100	100	94	+ 6

NOTES: All labor force data are from Bureau of Labor Statistics reports supplied by state agencies.
Only the unemployment rate data are seasonally adjusted.
The Southeast data represent the total of the six states.
N.A. = Not Available.

GENERAL

UNITED STATES

	LATEST DATA	CURR. PERIOD	PREV. PERIOD	YEAR AGO	ANN. % CHG.
Personal Income (bil. - SAAR)	Q2	3,705.2	3,660.3	3,523.8	+ 5
Taxable Sales bil.		N.A.	N.A.	N.A.	
Plane Pass. Arr. (thous.)		N.A.	N.A.	N.A.	
Petroleum Prod. (thous.)	NOV	8,280.1	8,207.9	8,458.6	- 2
Consumer Price Index 1967=100	NOV	345.8	345.3	330.8	+ 5
Kilowatt Hours - mils.	SEPT	216.4	235.6	202.8	+ 7

	DEC 1987	NOV 1987	DEC 1986	ANN. % CHG.
Agriculture				
Prices Rec'd by Farmers Index (1977=100)	128	131	121	+ 6
Broiler Placements (thous.)	91,460	85,094	85,554	+ 7
Calf Prices (per cwt.)	83.00	81.30	62.20	+33
Broiler Prices (¢ per lb.)	24.60	26.40	30.60	-20
Soybean Prices (per bu.)	5.57	5.27	4.67	+19
Broiler Feed Cost ($ per ton)	(Q4)193	(Q2)193	(Q4)177	+ 9

SOUTHEAST

	LATEST DATA	CURR. PERIOD	PREV. PERIOD	YEAR AGO	ANN. % CHG.
Personal Income (bil. - SAAR)	Q2	456 4	449 0	430.2	6
Taxable Sales - $ bil.		N.A.	N.A.	N.A.	
Plane Pass. Arr. (thous.)	NOV	N.A.	5,508.2	5,184.5	
Petroleum Prod. (thous.)	NOV	1,360.7	1,379.8	1,532.0	-11
Consumer Price Index 1967=100		N.A.	N.A.	N.A.	
Kilowatt Hours - mils.	SEPT	39.0	42.1	36.4	+ 7

	DEC 1987	NOV 1987	DEC 1986	ANN. % CHG.
Agriculture				
rices Rec'd by Farmers Index (1977 100)	121	133	111	+ 9
Broiler Placements (thous.)	38,697	35,197	35,592	+10
Calf Prices ($ per cwt.)	79.02	77.19	58.60	+35
Broiler Prices (¢ per lb.)	22.68	24.34	29.80	-24
Soybean Prices ($ per bu.)	5.72	5.43	4.80	+19
Broiler Feed Cost ($ per ton)	(Q4)187	(Q3)181	(Q3)179	+ 4

ALABAMA

	LATEST DATA	CURR. PERIOD	PREV. PERIOD	YEAR AGO	ANN. % CHG.
Personal Income (bil. - SAAR)	Q2	48.0	47.5	45.6	+ 5
Taxable Sales - $ bil.		N.A.	N.A.	N.A.	
Plane Pass. Arr. (thous.)	NOV	161.8	168.6	130.8	+24
Petroleum Prod. (thous.)	NOV	58.0	58.0	56.0	+ 4
Consumer Price Index 1967=100		N.A.	N.A.	N.A.	
Kilowatt Hours - mils.	SEPT	5.0	5.9	4.8	+ 4

	DEC 1987	NOV 1987	DEC 1986	ANN. % CHG.
Agriculture				
Farm Cash Receipts - $ mil. Dates: SEPT., SEPT.	1,309		1,345	- 3
Broiler Placements (thous.)	13,867	12,426	12,517	+11
Calf Prices ($ per cwt.)	76.30	75.40	58.50	+30
Broiler Prices (¢ per lb.)	21.90	24.00	28.00	-22
Soybean Prices ($ per bu.)	5.64	5.33	4.79	+18
Broiler Feed Cost ($ per ton)	189	185	191	- 1

FLORIDA

	LATEST DATA	CURR. PERIOD	PREV. PERIOD	YEAR AGO	ANN. % CHG.
Personal Income (bil. - SAAR)	Q2	183.4	178.5	170.0	+ 8
Taxable Sales - $ bil.					
Plane Pass. Arr. (thous.)	NOV	N.A.	2,569.4	2,523.8	
Petroleum Prod. (thous.)	NOV	21.0	21.0	26.0	-19
Consumer Price Index		NOV	SEP	NOV	
1977=100 MIAMI		183.4	181.3	175.8	+ 4
Kilowatt Hours - mils.	SEPT	12.7	12.6	11.5	+10

	DEC 1987	NOV 1987	DEC 1986	ANN. % CHG.
Agriculture				
Farm Cash Receipts - $ mil. Dates: SEPT., SEPT.	4,085		3,727	+10
Broiler Placements (thous.)	2,540	2,248	2,353	+ 8
Calf Prices ($ per cwt.)	86.50	81.00	61.00	+42
Broiler Prices (¢ per lb.)	23.00	24.60	30.00	-23
Soybean Prices ($ per bu.)	5.64	5.33	4.79	+18
Broiler Feed Cost ($ per ton)	189	185	191	- 1

GEORGIA

	LATEST DATA	CURR. PERIOD	PREV. PERIOD	YEAR AGO	ANN. % CHG.
Personal Income (bil. - SAAR)	Q2	86.9	85.8	81.3	+ 7
Taxable Sales - $ bil.		N.A.	N.A.	N.A.	
Plane Pass. Arr. (thous.)	NOV	1,907.8	2,048.8	1,901.1	+ 4
Petroleum Prod. (thous.)		N.A.	N.A.	N.A.	
Consumer Price Index 1967=100		N.A.	N.A.	N.A.	
Kilowatt Hours - mils.	SEPT	6.1	7.4	5.8	+ 5

	DEC 1987	NOV 1987	DEC 1986	ANN. % CHG.
Agriculture				
Farm Cash Receipts - $ mil. Dates: SEPT., SEPT.	1,795		2,174	-17
Broiler Placements (thous.)	15,209	13,839	14,044	+ 8
Calf Prices ($ per cwt.)	74.60	74.60	53.50	+40
Broiler Prices (¢ per lb.)	22.00	23.50	29.50	-25
Soybean Prices ($ per bu.)	5.69	5.52	4.71	+21
Broiler Feed Cost ($ per ton)	189	185	191	+ 1

LOUISIANA

	LATEST DATA	CURR. PERIOD	PREV. PERIOD	YEAR AGO	ANN. % CHG.
Personal Income ($ bil. - SAAR)	Q2	50.2	50.1	50.6	- 1
Taxable Sales - $ bil.		N.A.	N.A.	N.A.	
Plane Pass. Arr. (thous.)	NOV	334.1	338.2	302.7	+10
Petroleum Prod. (thous.)	NOV	1,206.7	1,225.8	1,371.0	-12
Consumer Price Index 1967=100		N.A.	N.A.	N.A.	
Kilowatt Hours - mils.	SEPT	5.9	6.2	5.8	+ 2

	DEC 1987	NOV 1987	DEC 1986	ANN. % CHG.
Agriculture				
Farm Cash Receipts - $ mil. Dates: SEPT., SEPT.	670		698	- 4
Broiler Placements (thous.)	N.A.	N.A.	N.A.	
Calf Prices ($ per cwt.)	78.00	83.00	58.50	+33
Broiler Prices (¢ per lb.)	23.00	24.60	30.00	-23
Soybean Prices ($ per bu.)	5.71	5.49	4.70	+21
Broiler Feed Cost ($ per ton)	178	165	144	+24

MISSISSIPPI

	LATEST DATA	CURR. PERIOD	PREV. PERIOD	YEAR AGO	ANN. % CHG.
Personal Income (bil. - SAAR)	Q2	26.5	26 5	25.5	+ 4
Taxable Sales - $ bil.		N.A.	N.A.	N.A.	
Plane Pass. Arr. (thous.)	NOV	39.2	42.2	38.0	+ 3
Petroleum Prod. (thous.)	NOV	75.0	75.0	79.0	- 5
Consumer Price Index 1967=100		N.A.	N.A.	N.A.	
Kilowatt Hours - mils.	SEPT	2.8	3.0	2.6	+ 8

	DEC 1987	NOV 1987	DEC 1986	ANN. % CHG.
Agriculture				
Farm Cash Receipts - $ mil. Dates: SEPT., SEPT.	896		966	- 7
Broiler Placements (thous.)	7,082	6,684	6,678	+ 6
Calf Prices ($ per cwt.)	80.70	77.70	62.00	+30
Broiler Prices (¢ per lb.)	25.00	26.30	33.20	-25
Soybean Prices ($ per bu.)	5.73	5.43	4.88	+17
Broiler Feed Cost ($ per ton)	178	165	144	+24

TENNESSEE

	LATEST DATA	CURR. PERIOD	PREV. PERIOD	YEAR AGO	ANN. % CHG.
Personal Income ($ bil. - SAAR)	Q2	61.4	60.6	57.2	+ 7
Taxable Sales - $ bil.		N.A.	N.A.	N.A.	
Plane Pass. Arr. (thous.)	NOV	329.2	341.0	288.1	+14
Petroleum Prod. (thous.)		N.A.	N.A.	N.A.	
Consumer Price Index 1967=100		N.A.	N.A.	N.A.	
Kilowatt Hours - mils.	SEPT	6.5	7.0	5.9	+10

	DEC 1987	NOV 1987	DEC 1986	ANN. % CHG.
Agriculture				
Farm Cash Receipts - $ mil. Dates: SEPT., SEPT.	1,197		1,128	+ 6
Broiler Placements (thous.)	N.A.	N.A.	N.A.	
Calf Prices ($ per cwt.)	76.50	72.90	56.80	+35
Broiler Prices (¢ per lb.)	23.00	24.60	30.00	-23
Soybean Prices ($ per bu.)	5.80	5.37	4.88	+19
Broiler Feed Cost ($ per ton)	202	208	181	+12

NOTES: Personal Income data supplied by U. S. Department of Commerce. Taxable Sales are reported as a 12-month cumulative total. Plane Passenger Arrivals are collected from 26 airports. Petroleum Production data supplied by U. S. Bureau of Mines. Consumer Price Index data supplied by Bureau of Labor Statistics. Agriculture data supplied by U. S. Department of Agriculture. Farm Cash Receipts data are reported as cumulative for the calendar year through the month shown. Broiler placements are an average weekly rate. The Southeast data represent the total of the six states. N. A. = not available. The annual percent change calculation is based on most recent data over prior year. R = revised.

CONSTRUCTION

(12-month cumulative rate)

UNITED STATES

Nonresidential Building Permits - $ Mil.	NOV 1987	OCT 1987	NOV 1986	ANN. % CHG.
Total Nonresidential	51,050	50,873	49,008	+ 4
Industrial Bldgs.	7,615	7,650	7,650	-13
Offices	13,707	13,863	14,336	- 4
Stores	12,894	12,664	11,962	+ 8
Hospitals	2,453	2,423	2,545	- 4
Schools	1,035	1,033	1,236	-16

	NOV 1987	OCT 1987	NOV 1986	ANN. % CHG.
Residential Building Permits Value - $ Mil.	96,211	95,926	93,226	+ 3
Residential Permits - Thous. Single-family units	1,042.3	1,041.6	1,056.0	- 1
Multifamily units	520.0	528.5	684.0	-24
Total Building Permits Value - $ Mil.	143,924	143,462	142,234	+ 1

SOUTHEAST

Nonresidential Building Permits - $ Mil.	NOV 1987	OCT 1987	NOV 1986	ANN. % CHG.
Total Nonresidential	7,856	7,766	8,001	- 2
Industrial Bldgs.	917	924	1,091	-16
Offices	1,819	1,833	1,958	- 7
Stores	2,417	2,311	2,304	+ 5
Hospitals	566	585	422	+34
Schools	260	265	160	+62

	NOV 1987	OCT 1987	NOV 1986	ANN. % CHG.
Residential Building Permits Value - $ Mil.	15,817	15,788	15,875	- 0
Residential Permits - Thous. Single-family units	204.6	204.6	205.6	- 0
Multifamily units	109.0	111.5	145.9	-25
Total Building Permits Value - $ Mil.	23,264	23,524	23,876	- 3

ALABAMA

Nonresidential Building Permits - $ Mil.	NOV 1987	OCT 1987	NOV 1986	ANN. % CHG.
Total Nonresidential	537	532	577	- 7
Industrial Bldgs.	30	41	76	-61
Offices	213	182	133	+60
Stores	173	174	171	+ 1
Hospitals	13	14	24	-46
Schools	22	22	17	+29

	NOV 1987	OCT 1987	NOV 1986	ANN. % CHG.
Residential Building Permits Value - $ Mil.	643	642	668	- 4
Residential Permits - Thous. Single-family units	10.6	10.6	10.9	- 3
Multifamily units	4.3	4.2	8.0	-46
Total Building Permits Value - $ Mil.	1,181	1,174	1,245	-14

FLORIDA

Nonresidential Building Permits - $ Mil.	NOV 1987	OCT 1987	NOV 1986	ANN. % CHG.
Total Nonresidential	3,795	3,792	3,922	- 3
Industrial Bldgs.	374	382	422	-11
Offices	772	782	963	-20
Stores	1,091	1,083	1,118	- 2
Hospitals	287	301	241	+19
Schools	96	97	45	+113

	NOV 1987	OCT 1987	NOV 1986	ANN. % CHG.
Residential Building Permits Value - $ Mil.	9,106	9,103	8,671	+ 5
Residential Permits - Thous. Single-family units	111.3	111.4	105.9	+ 5
Multifamily units	76.9	78.3	91.3	-16
Total Building Permits Value - $ Mil.	12,901	12,895	12,593	+2

GEORGIA

Nonresidential Building Permits - $ Mil.	NOV 1987	OCT 1987	NOV 1986	ANN. % CHG.
Total Nonresidential	1,820	1,785	1,752	+ 4
Industrial Bldgs.	268	251	341	-22
Offices	460	496	389	+18
Stores	578	529	493	+17
Hospitals	118	122	37	+219
Schools	97	98	38	+155

	NOV 1987	OCT 1987	NOV 1986	ANN. % CHG.
Residential Building Permits Value - $ Mil.	3,555	3,530	3,771	+ 2
Residential Permits - Thous. Single-family units	48.1	48.0	51.5	-17
Multifamily units	17.3	17.9	26.1	-34
Total Building Permits Value - $ Mil.	4,996	5,316	5,523	-10

LOUISIANA

Nonresidential Building Permits - $ Mil.	NOV 1987	OCT 1987	NOV 1986	ANN. % CHG.
Total Nonresidential	397	404	581	-32
Industrial Bldgs.	17	16	45	-62
Offices	81	88	172	-53
Stores	163	156	152	+ 7
Hospitals	85	87	43	+98
Schools	16	20	41	-61

	NOV 1987	OCT 1987	NOV 1986	ANN. % CHG.
Residential Building Permits Value - $ Mil.	435	433	587	-26
Residential Permits - Thous. Single-family units	7.0	7.0	8.8	-21
Multifamily units	0.7	0.7	2.8	-75
Total Building Permits Value - $ Mil.	831	837	1,168	-29

MISSISSIPPI

Nonresidential Building Permits - $ Mil.	NOV 1987	OCT 1987	NOV 1986	ANN. % CHG.
Total Nonresidential	227	231	257	-32
Industrial Bldgs.	27	29	28	-62
Offices	57	53	62	-53
Stores	67	70	83	+ 7
Hospitals	19	22	22	+98
Schools	12	11	8	+50

	NOV 1987	OCT 1987	NOV 1986	ANN. % CHG.
Residential Building Permits Value - $ Mil.	299	300	356	-16
Residential Permits - Thous. Single-family units	5.0	5.0	5.8	-14
Multifamily units	1.0	1.1	2.7	-63
Total Building Permits Value - $ Mil.	526	531	613	-14

TENNESSEE

Nonresidential Building Permits - $ Mil.	NOV 1987	OCT 1987	NOV 1986	ANN. % CHG.
Total Nonresidential	1,080	1,021	912	+18
Industrial Bldgs.	201	207	180	+12
Offices	237	231	238	- 0
Stores	345	298	285	+21
Hospitals	43	40	55	-28
Schools	17	17	12	+42

	NOV 1987	OCT 1987	NOV 1986	ANN. % CHG.
Residential Building Permits Value - $ Mil.	1,779	1,779	1,821	- 2
Residential Permits - Thous. Single-family units	22.7	22.6	22.7	0
Multifamily units	8.8	9.3	15.0	-41
Total Building Permits Value - $ Mil.	2,829	2,770	2,733	+ 4

NOTES: Data supplied by the U. S. Bureau of the Census, Housing Units Authorized By Building Permits and Public Contracts, C-40. Nonresidential data exclude the cost of construction for publicly owned buildings. The Southeast data represent the total of the six states.

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