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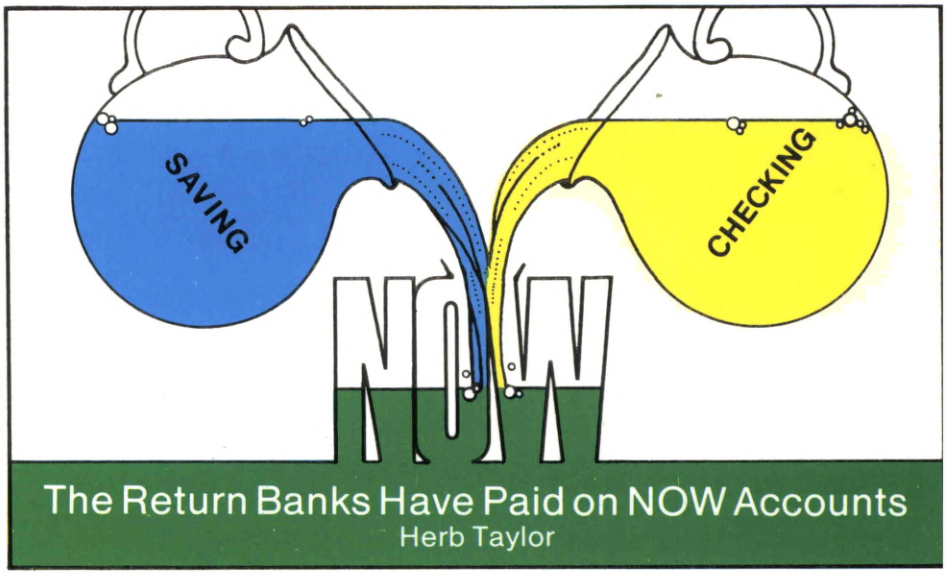

The Return Banks Have Paid on NOW Accounts

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New Markets in Foreign Currency Options

*Brian Gendreau**

INTRODUCTION

In recent years, exchanges and banks have developed a variety of new financial instruments designed to give customers the option to buy or sell foreign currencies. Exchanges in Amsterdam, Montreal, and Philadelphia opened trading in standardized options on foreign currencies in late 1982. Banks responded by resurrecting an old practice of writing tailor-made foreign currency options for their customers. And in January, 1984 the Chicago Mercantile Exchange opened trading in the newest instrument, an option on its Deutsche mark *futures* contract.

How do these new currency options work? What do options allow traders to do that they cannot do already in foreign currency markets? Under what circumstances will they do well in the marketplace? As a first step toward examining these issues, it is important to understand exactly what options are.

WHAT ARE OPTIONS?

An option is a contract that gives its holder the

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right, but not the obligation, to buy or sell an asset on or before a future date at a specified price. In this regard options differ crucially from forward and futures contracts, which are firm commitments to buy or sell an asset at a fixed price on a future date. Once forward and futures contracts are made, they must be fulfilled whether prices have moved favorably or not.[1]

An option that can be exercised only on its expiration date is called a European option; one that can be exercised anytime up to expiration is called an American option. Theoretically, options can be written on any asset or commodity, be it a crop, real estate, a security, or a futures contract. With foreign currency options, the underlying asset is a specified quantity of a foreign currency, say, 12,500 British pounds or 62,500 Swiss francs.

Foreign currency options, like all other options, involve two transactions. The first transaction is the purchase or sale of the *option* itself: one party buys from the other the right to exchange dollars for foreign currency in the future at a set price, known as the exercise or striking price. The person obtaining the right to make the future exchange is known as the option buyer or holder, and the person granting the right is known as the option seller or writer. To have the privilege of exchanging the currency at the price specified in the option contract, the buyer must pay the seller a fee, called a premium.

The second transaction in an option is the future exchange of the underlying *asset*: the foreign currency. This exchange may be one of two kinds. In a *call* option, dollars may be exchanged for a specified quantity of the foreign currency; a call is thus a contract for the right to buy the foreign currency. In a *put* option, a specified quantity of the foreign currency may be exchanged for dollars; it is a contract for the right to sell the foreign currency. Because options may be bought or sold for the right to buy or sell foreign currency, four basic trading positions are possible. A market participant can:

1. buy a call, obtaining the right to purchase the foreign currency;
2. sell a call, standing ready to sell the foreign currency at the option buyer's discretion;
3. buy a put, obtaining the right to sell the foreign currency; or
4. sell a put, standing ready to buy the foreign currency at the option buyer's discretion.

Each of these four positions exposes the trader to different risks and returns. Why a trader would choose to take on any of these positions may be best explained with examples, beginning with foreign currency calls.

RISKS AND REWARDS IN TRADING CURRENCY OPTIONS

Call Options. Suppose a trader has good reason to think that the Swiss franc will rise relative to the dollar by more than the market expects. One way to profit from that information is to buy a call option on francs. The trader could, for example, buy a call in March giving him the right to purchase 62,500 francs at a price of $.46 apiece in June, paying (for example) a $560 premium for the option. If the trader is correct and by March the franc rises—say to $.48—the trader can exercise the option, buy the francs from the option writer at the exercise price, $.46, then sell them in the spot market at $.48 for a profit of $1,250—more than enough to cover the premium. If, instead, the franc does not rise above the option's exercise price, the trader will let the option lapse and lose the premium. In no event, however, will the buyer lose more than the $560 paid for the premium.

Put Options. In contrast to calls, in which buyers gain from unexpected rises in the spot price, puts enable buyers to gain from unexpected *declines* in the spot price. Specifically, the buyer of a put held to expiration will profit if the price of the underlying currency falls below the exercise price by more than enough to cover the cost of the premium. If the currency price does not fall below the option's exercise price, the buyer will lose the premium.

To see how puts can be used to profit from exchange rate declines, imagine a trader who be-

[1] Forward and futures contracts can be fulfilled either by delivering the currency specified in the contract or by making a second, offsetting contract. Forward contracts for foreign exchange are generally made with commercial banks and can be tailored to specific customer needs. Futures contracts are similar to forward contracts, but are traded in standardized quantities with regular maturities on organized exchanges, are guaranteed by the exchanges, and generally require a security deposit (called a "margin"). See K. Alec Chrystal, "A Guide to Foreign Exchange Markets," Federal Reserve Bank of St. Louis *Review*, Vol. 66, No. 3 (March 1984) pp. 5-18.

lieves that the Japanese yen will drop relative to the dollar by more than the rest of the market expects. The trader could bet on the extra decline by paying, say, a $225 premium for a June put on 6,250,000 yen with an exercise price of $.0042. If by June the yen falls unexpectedly, say to $.0040, the trader will find it profitable to exercise the put and sell the yen purchased in the spot market at $.0040 to the option seller at the exercise price of $.0042 for a gain of $1,250, an amount that more than offsets the cost of the premium.

These examples illustrate two important features of option trading. First, the amount the option buyer stands to gain depends on the movement of the spot price of the underlying currency relative to the option's exercise price. Second, the risks in option trading are asymmetric. The most the option buyer stands to lose is the premium, while his potential gains are limited only by the subsequent movement of the underlying currency's exchange rates. By the same token, the most the option seller can gain is the premium, though his potential losses are bounded only by the range of future exchange rate movements.[2] In effect, the option buyer is paying the seller to take on his risk, and the premium will rise to a value that compensates the seller for assuming that risk.

In contrast to options, the upside and downside risks in trading forward and futures contracts are symmetric. The buyer of a forward contract held to maturity will lose, dollar for dollar, as much when the spot price falls below the contract price as he will gain when the spot price rises above the contract price. Options are thus likely to attract traders who wish to profit from movements of prices in one direction while limiting their losses from adverse price movements. In addition, options are likely to attract traders who wish to profit from misalignments between prices on forward or futures contracts and prices on options. Option and forward foreign exchange prices, therefore, are not independent. (See the APPENDIX: PUT-CALL PARITY).

[2]Puts and calls can also be combined in a number of complex strategies to bet on price volatility, rather than on the direction of a price movement. For a discussion of these strategies in currency option markets, see Ian H. Giddy, "Foreign Exchange Options," *The Journal of Futures Markets*, Vol. 3, No. 2 (1983) pp. 143-166.

USING OPTIONS TO HEDGE CONTINGENCIES

The asymmetries between potential gains and losses in options allow them to be used—in ways that forwards and futures cannot—to hedge *contingencies*: transactions that are not certain to materialize. Consider, for example, a U.S. firm that has submitted a competitive bid in pounds to supply communications equipment in Britain. If it wins the bid, it will receive pounds, which it will then want to convert into dollars. Until the bids are awarded, the firm is exposed to the risk of a decline in the value of the pound, which would reduce the value of the contract award if it wins the bid. The firm would like to hedge against this risk. Forward or futures contracts are not the right hedging instruments in this case because it is not certain that the firm will actually be awarded the bid. If the firm tries to hedge the bid by selling pounds under a forward contract, and then fails to win the bid, it will be left with a forward contract but no matching business transaction in the foreign currency. The firm will have started out trying to reduce its foreign exchange risk, only to wind up with a foreign currency exposure after all.

To hedge a contingent transaction like a competitive bid a firm should use an option; in this case it should buy a put. If the anticipated transaction does occur, the firm can exercise the option and sell the foreign currency it receives at a set price. If, instead, the transaction falls through, the firm can simply let the option expire. From the firm's perspective, buying an option is like buying insurance against foreign exchange risk by paying the option seller a premium to cover its risk.

Contingent transactions are not uncommon in international finance. The terms of an investment in a foreign firm, for example, may include the acquisition of warrants to buy the firm's shares at a fixed price in the future, with payment in the foreign currency. In another case, a firm's future foreign currency requirements may hinge upon whether it decides to take advantage of an option it has obtained to purchase a foreign asset—say, the right to purchase a hotel in Bavaria. Or a firm may anticipate receiving a future award in a foreign currency depending upon the outcome of a lawsuit in a foreign court. Each of these possible, but not certain, future claims or liabilities in a foreign currency can be hedged with options. The warrants and hotel option can be covered by buying calls,

and the potential receipt of a lawsuit award covered by buying a put.

THE DEMAND FOR CURRENCY OPTIONS

Despite the advantages currency options have over forward and futures contracts in some situations, no markets existed for these options until recently. An unsuccessful effort had been made to start a market for puts and calls on foreign currencies in New York in the 1920s, and U.S. banks have occasionally arranged currency options privately for customers since the 1940s. But by and large, the market for currency options was dormant until the European Options Exchange (Amsterdam), the Montreal Exchange, and the Philadelphia Stock Exchange opened trading in currency options in late 1982. Once currency option trading was established on these exchanges, banks began writing substantial quantities of currency options for customers, creating an over-the-counter market parallel to the exchange markets.

The recent demand for currency options can be attributed to two factors: increased exchange rate volatility and the growth of international trade. Prior to 1971, exchange rates were not as variable as they are now. At the Bretton Woods conference in 1944, the industrial nations agreed to have their central banks buy and sell dollars to keep exchange rate movements within fairly narrow bounds. As a result, traders expected little variability in exchange rates. Under these circumstances, few market participants were willing to pay for option contracts to provide protection against adverse exchange rate movements: the costs to maintaining uncovered foreign currency positions were small, as were the fees writers could have earned by producing option coverage.

After this system of nearly-fixed exchange rates collapsed in 1971, most major currencies began to float with market forces and exchange rates became more volatile. The average monthly range of fluctuations of the Deutsche mark to the dollar, for example, widened from .44 cents over the 1959 to 1971 period to 5.66 cents between 1971 and 1982—a more than twelvefold increase. At the same time that exchange rates were becoming more variable, the volume of trade in goods and services and financial flows between nations continued to grow. The sum of exports and imports in the U.S. alone grew from $135.9 billion in 1971 to $265.7 billion in 1982 in constant (inflation-adjusted) dollars. Forward and futures contracts could have been used to hedge the lion's share of these international transactions. Some portion of foreign trade, however, is carried out under contingent contracts, for which options are the desired hedging tool. Assuming that the proportion of contingencies in international trade is constant, the combination of volatile exchange rates and growing trade meant inevitably that a market for foreign currency options to hedge those contingencies would also grow. It was to meet this expanding market that exchanges and banks began to offer options.

CREATORS OF CURRENCY OPTION MARKETS

The existence of markets is often taken for granted, but creating a market can be a costly and risky venture. Before trading can advance beyond the crudest type of barter, several obstacles must be overcome. First, someone must provide the physical facilities for bringing buyers and sellers together, whether they are open-air booths, a bank of telephones, or an elaborate computerized trading floor. Next, someone has to provide a mechanism for matching buyers' and sellers' orders at a common price. Small markets sometimes employ an auctioneer, but most markets rely on dealers or market-makers: firms that stand ready to trade with customers, buying and selling for their own account. Standing ready to trade with customers immediately, however, is risky: the danger always exists that the next customer may be willing to buy only at a price that is less than the price the last seller received. Markets for assets that are not physically present when agreements are made to exchange must overcome yet another problem, the risk that the other party to the transaction will default. Agreements made under these circumstances are promises to trade, and trading will falter unless these is some assurance that the promises will be kept.[3] Exchanges and banks have taken different approaches to overcoming these obstacles, producing different kinds of option contracts and trading procedures.

[3]Sir John Hicks has called trading in markets where the goods are not present "trading in promises." See his book *A Theory of Economic History* (Oxford: Oxford University Press, 1969) for a discussion of the crucial role of market-makers and contract protection in the development of markets.

Exchange Options. The Amsterdam, Montreal, and Philadelphia exchanges have devoted resources to providing centralized trading floors, and have adopted the open outcry system for matching option buyers to sellers (See EXECUTING CURRENCY OPTION TRADES). To open trading in currency options to a wide range of participants, the exchanges have adopted contract designs and trading safeguards that have proven successful on futures exchanges and common stock option exchanges. To begin with, currency options on all three exchanges were designed as American options with standardized trading units and expiration dates. (See CONTRACT SPECIFICATIONS ON THE AMSTERDAM, MONTREAL, AND PHILADELPHIA EXCHANGES). Contract standardization helps to reduce the number of dimensions over which buyers and sellers must agree. Some flexibility is lost as a result, but standardization is probably necessary for contract trading in a central marketplace: matching customers with a wide range of quantity and maturity preferences would be an administrative nightmare.[4] By standardizing the contract terms the exchanges have made it possible to trade options in a secondary market—a market in which options can be bought and sold many times before expiration. Indeed, exchange options are so readily accepted by traders that no distinction exists between new and resold options: all are traded interchangeably on the exchange floor.[5]

[4]Just imagine the difficulties involved in trying to negotiate a match between a buyer's order for a June 17th option on 145,000 Deutsche marks with a striking price of .366 to a seller's order for an option on 112,500 marks, to expire July 2nd, with a striking price of .373.

[5]Once a secondary market exists, buyers may find it easier to sell the option to a new buyer rather than to exercise the option and actually take delivery of (or deliver) the underlying currency. The premium on the option will always rise to reflect a difference between the spot price and the option's exercise

EXECUTING CURRENCY OPTION TRADES

The way currency option trades are made is perhaps best illustrated by following a typical trade through the Philadelphia Stock Exchange; the other exchanges follow essentially similar procedures. Suppose a customer wants to buy a British pound option with a $1.45 exercise price and June expiration date at the best price available on the market. The trading process begins when the customer calls a broker who is a member of the exchange and places the order. The broker books and clocks the order, then relays it electronically to the broker's booth on the exchange trading floor. The broker's floor trader then walks over to the other pound contract traders standing near the screens on which trades are reported, and shouts out his bid of, say, 1¢. Option price bids are quoted at cents per unit of the underlying currency, and a bid of 1¢ on a 12,500 British pound contract is equal to a premium of $125.

The floor trader's bid would be answered by offers to sell from other traders, at (say) 1.25¢, 1.20¢, and 1.15¢. The offers may be coming from three kinds of traders: specialists, market-makers, or floor brokers acting as agents for other customers. *Specialists* are firms designated by the exchange to maintain orderly trading and manage the limit orders for each currency. Some customers give their brokers orders to buy or sell only when prices reach a certain limit (say, "buy at $130.00" or "sell at $150.00"), and the specialist coordinates these orders. *Market-makers* are member firms who buy and sell for their own account, and who must make a bid or offer on a customer's order if called upon to do so by the specialist. In return for standing ready to trade even when it is not always in their interest to do so, market-makers enjoy reduced margin requirements, and are able to execute trades for their own account faster than traders who must use a broker.

The floor trader takes the lowest offer—in this case 1.15¢, implying a premium of $143.75—and "matches tickets" with the selling trader, confirming the trade in pencil on printed paper slips. The buying trader hands the slips to the specialist, who staples them and gives them to an exchange employee who puts the information into the exchange's computerized reporting system. As soon as the trade is in the exchange's reporting system it is flashed onto the trading floor screens and private wire service screens. By SEC rules, the trade must be reported on the system within 90 seconds of when it occurred. The broker's floor trader then wires confirmation of the trade back to the broker, who advises his customer that the trade has been completed. If the option seller is another customer rather than a market-maker, the seller's order will have followed a similar path through the customer's broker to the exchange floor, with one difference: the seller's broker will have required a margin deposit from its customer to protect the broker, the exchange's clearing corporation, and the option buyer from default.

The greatest obstacle to achieving widespread participation in option trading is credit risk: option buyers are at risk that sellers will default when the options are exercised. To assure buyers that sellers will fulfill their contracts, the exchanges restrict trading privileges to members and provide clearing corporation guarantees for their options. Exchange rules require the public to trade currency options through exchange member firms, who are liable to other members for their customers' traders. In the event that an option seller defaults, then, the seller's member firm is responsible for completing the contract with the buyer's member firm. As a result, members have an incentive to execute trades only for customers they believe are willing and able to honor their contracts. The clearing corporation guarantees, however, provide an even stronger safeguard for traders. All organized options exchanges are affiliated with a clearing corporation, a non-profit organization of member firms that clears trades on the exchange.[6] Though

price, and will generally exceed this amount, reflecting the probability that the spot price might deviate even further from the exercise price before the option expires. See Robert A. Jarrow and Andrew Rudd, *Option Pricing* (Homewood, Ill.: Irwin, Inc., 1983) for a discussion of the determinants of option prices.

CONTRACT SPECIFICATIONS ON THE AMSTERDAM, MONTREAL, AND PHILADELPHIA EXCHANGES

The European Options Exchange (Amsterdam), the Montreal Exchange, and the Philadelphia Stock Exchange all offer trading in standardized puts and calls on foreign currencies. The following table gives the number of foreign currency units underlying each option contract offered on the three exchanges:

Currency	Trading Units		
	European Options Exchange (Amsterdam)	Montreal Exchange	Philadelphia Stock Exchange
British pounds	£5,000	£5,000	£12,500
Canadian dollars	—	CD 50,000	CD 50,000
Deutsche marks	$10,000	DM 25,000	DM 62,500
Japanese yen	—	¥ 2,500,000	¥ 6,250,000
Swiss francs	—	SF 25,000	SF 62,500
Dutch guilders	$10,000	—	—

— Indicates that the contract is not offered on that exchange.

Payment for all options on the Montreal and Philadelphia exchanges is in U.S. dollars. Payment for each of the options offered on the Amsterdam exchange, however, is in a different currency. The Amsterdam exchange offers an option on British pounds with payment in U.S. dollars, an option on U.S. dollars with payment in Dutch guilders, and an option on U.S. dollars with payment in Deutsche marks. Contracts on all three exchanges are issued with maturities of 3, 6, and 9 months, with expiration dates set in March, June, September, and December to coincide with the maturity dates of the CME's International Monetary Market's foreign currency futures contracts. Option contract sizes are also compatible with the IMM's futures contracts; the Philadelphia exchange's options, for example, are exactly one half the size of the corresponding IMM futures contracts. Making currency option contracts compatible with futures contracts facilitates cross-trading between the two kinds of instruments, encouraging trading volume growth in both markets.

customers trade options with each other through member firms on the exchange, options are legally contracts with the clearing corporation, not other customers. In effect, the clearing corporation inserts itself between the buyer and seller of every option, giving each party a contract with the clearing corporation. The clearing corporation guarantees all trades, and stands ready to assess its member firms to cover losses resulting from a default by a member firm. To protect itself from losses, the clearing corporation requires that a security deposit known as a margin be posted by exchange members that have sold options; the members in turn generally require their customers to make margin deposits with them. By providing for clearing corporation guarantees, the exchanges have created an option instrument that people can trade without worrying about each other's creditworthiness.

Options on Currency Futures. Recently, the Chicago Mercantile Exchange (CME) introduced a new option instrument to compete with the currency options offered by exchanges and banks: an option on a foreign currency futures contract. This option contract gives the holder the right to buy or sell a futures contract for Deutsche marks, rather than the marks themselves. When a buyer exercises this option, he or she receives a futures contract to buy or sell 125,00 Deutsche marks on the CME's International Monetary Market at a set price. The futures contract can either be offset immediately to take the gain, or can be held to maturity. Like the currency options offered on other exchanges, the CME's option has standardized delivery dates and is guaranteed by a clearing corporation.

At first glance, an option on a futures contract rather than on the underlying currency appears to be an unnecessarily cumbersome instrument. For a number of reasons, however, options on futures and currency options may be close substitutes. Futures prices and spot currency prices are closely correlated, so that an option on a futures contract is for most purposes as effective a hedging instrument as an option on the currency itself. Moreover, currency futures markets are more accessible to small traders seeking to make large trades than are spot or forward foreign currency markets. In trading spot currencies with a bank, small traders typically would have to pay retail prices that are higher than the wholesale prices charged on large trades. In addition, banks are reluctant to make forward contracts that are large relative to the resources of small traders. In contrast, arranging for a large futures contract to make delivery under an option is no problem for small traders. Also, an option on a futures contract makes it easy for traders to shift between options and futures to take advantage of temporary price misalignments between the two markets. The CME hopes that its option on a futures contract will be attractive to the kinds of traders who currently trade currency options and will appeal to new groups of traders as well.

Bank Options. The bank market for foreign currency options is composed of large U.S. banks which write options for their corporate customers. When banks write puts and calls, they are creating a market individually by buying and selling for their own account. Banks provide no trading floors for the exchange of orders; instead, they quote prices directly to customers, often by telephone. Usually, banks only sell options, and write the contracts as European options. Because the option seller is commonly a bank with whom the customer has had a long-standing relationship, the customer generally has little concern that the bank will default on the option.

Banks write currency options on an individual basis, tailoring the contracts to the specific currency, quantity, and maturity needs of each customer. Not surprisingly, no secondary market yet exists for bank options: creating a secondary market would require banks to agree to some minimal contract standardization conventions, and reaching such an agreement is likely to take some time. Banks sometimes reduce the risks they have taken in selling options, however, by buying currency options on an exchange. When banks completely offset their option sales in this way, they are acting as middlemen between their customer and the

[6]Options on the Philadelphia Stock Exchange are cleared and guaranteed by the Options Clearing Corporation, which also clears and guarantees equity and debt options traded on the American Options Exchange, the Chicago Board Options Exchange, the Pacific Stock Exchange, and the New York Stock Exchange. Currency options on the European Options Exchange and the Montreal Exchange are cleared and guaranteed by the International Options Clearing Corporation, which is operated as a joint venture with the Vancouver Stock Exchange and Sydney Stock Exchange.

ultimate sellers of the contract. When banks choose instead not to offset options written for customers, they are acting as insurers, bearing their customers' exchange risk in return for fee income.

WHICH OPTION MARKETS WILL PROSPER?

Is the market for currency options large enough to accommodate the growing number of competitors seeking to provide traders with options? Will customers prefer some types of currency option markets to others? To the extent that differences among the option contracts offered in various markets are small, traders are likely to gravitate to the market that promises the highest trading volume. Studies of futures markets have shown that trading costs decline with volume, so that a single market for any contract will provide lower cost trading than two markets that each have half as much volume.[7] This explains why each contract traded in financial futures markets has come to be traded on a single exchange, unless the exchanges have been located on different continents (with different trading hours), and there is little reason to believe that the experience with trading in foreign currency options will be different. If, on the other hand, the differences in option contracts offered in various markets are large, each contract may appeal to traders with different needs, and all market-makers may coexist.

Differences among exchanges' options are small: the currency options traded on the Amsterdam, Montreal, and Philadelphia exchanges are fundamentally the same instruments, and it is clear that the three exchanges are competing head to head for the same kind of customers. So far, the Philadelphia Stock Exchange has generated by far the greatest trading volume: trading has expanded rapidly from an average of 394 puts and calls per day in January 1983 to over 5,778 per day in March 1984. The Philadelphia Stock Exchange has generated more trading in each of its contracts than the other two exchanges, with the exception of the Canadian dollar option, which traded in greater volume in Montreal than in Philadelphia in every month but one in 1983. Volume on all three exchanges has picked up sharply in early 1984, reflecting in part an increase in exchange rate volatility in the first three months of the year.

Options based on currencies and the CME's option on a currency futures contract are similar enough to suggest that the CME will also be competing directly with the other exchanges. The CME's Deutsche mark futures option has done well since its introduction on January 24, 1984: an average of 1,954 calls and puts were traded per day in February, 2,756 in March, and 2,332 in April 1984. Nevertheless, trading volume in Philadelphia's mark contract is still growing, indicating that for the time being both exchanges are sharing an expanding market.

While the differences among the exchanges' options are small, differences between the kinds of options offered by the exchanges and those offered by banks are large enough to suggest that they may attract different customers. The standardized and guaranteed options available on exchanges are likely to attract buyers who need options on major currencies and buyers who do not wish to incur the costs of searching out and evaluating the credit of sellers. In addition, the exchanges are likely to attract small investors: trading on exchanges is open to virtually all buyers, and to any sellers able to meet their brokers' margin requirements. The tailor-made options written by banks, on the other hand, are likely to be attractive to customers who need options in less frequently traded currencies, or who need options for maturities that differ substantially from those offered by exchanges. Bank options are also likely to attract customers who have an infrequent need for options, but make forward contracts with banks regularly.

To date, trading on the Philadelphia exchange has attracted a large number of foreign firms and individual investors, as well as U.S. and foreign banks.[8] Banks, in contrast, appear to have written options mostly for large U.S. and multinational corporations, many of whom already use the

[7] See Lester G. Telser, "Why Are There Organized Futures Exchanges?" *Journal of Law and Economics*, Vol. 24, No. 1 (April 1981).

[8] Subsidiaries of two bank holding companies, Bank of America and Citicorp, began serving as specialists on the floor of the Philadelphia Stock Exchange in 1984. In addition, in April 1984 the Federal Reserve Board approved an application of Fidelcor, Inc., a Pennsylvania bank holding company, to trade foreign currency options for its customers through a subsidiary.

banks for their forward foreign exchange trading. These differences in customers indicate that exchange and bank options may exist side by side for some time, much as futures and forward markets for foreign exchange have coexisted during the past decade.

CONCLUSION

Since late 1982, traders have been able to use options on foreign currencies in addition to forward and futures contracts to manage their exchange rate risk. These options allow traders to profit from favorable exchange rate changes while avoiding the risks of adverse movements. Because they convey the right, but not the obligation, to buy or sell a foreign currency, options can be used to hedge transactions that are not certain to occur, a task for which forward and futures contracts are not well suited.

Continued volatility in exchange rates and growth in international trade will ensure a demand for currency options. Exchange options and over-the-counter bank options are likely to coexist for some time because they are different instruments and appeal to different customers. Many exchange options, however, are close substitutes for each other. The experience with futures markets suggests that not all exchanges' options will prosper, and that traders will increasingly give their business to the market able to offer the greatest volume and lowest cost trades.

APPENDIX

Put-Call Parity

Though options and forward contracts are distinct instruments, their prices are linked together by the actions of traders who buy and sell both instruments in search of profits. The basic trading strategy for profiting from a price difference between option and forward markets is called a *reversal*. With this strategy, a trader simultaneously buys a call and sells a put, both for the same expiration date and exercise price E. This strategy will give the trader a pattern of gains and losses that duplicates that on a forward contract to purchase the currency on that expiration date at the exercise price E. The trader will, by maturity, gain dollar-for-dollar on the call by the amount the spot price rises above E, or lose dollar-for-dollar on the put by the amount the spot price falls below E, just as he would on a forward contract. The price at which the trader has effectively purchased currency forward, however, should take into account the interest cost of borrowing the difference between the premium C paid for the call and the premium P received for the put (if C is greater than P) over the life of the contracts. Assuming the trader can borrow at an interest rate i, the price at which the trader is buying the currency forward under the reversal will be:

$$E + (C - P)(1 + i) \tag{1}$$

where C and P are measured per quantity of currency traded.

If the cost of obtaining the currency using this strategy is cheaper than buying it under a forward contract at the going forward rate F, the trader will, by coupling the reversal with a forward sale, earn a profit of π_r:

$$\pi_r = F - E - (C - P)(1 + i) \tag{2}$$

Alternatively, if the cost of buying currency under a forward contract is cheaper than obtaining it by combining puts and calls, the trader could profit by executing the mirror image trade of the reversal called a *conversion*. Here the trader would create an artificial contract to sell the currency forward by buying a put, selling a call, and investing the difference (if it is positive) between the two premiums in a money market instrument paying a rate of interest i. This strategy will, coupled with a forward purchase, produce a profit of π_c:

$$\pi_c = E + (C - P)(1 + i) - F \tag{3}$$

As many traders try to take advantage of price differentials between the forward and options markets, they will drive the call prices up and put prices down when executing reversals (and drive call prices down and put prices up in executing conversions) until no more profits can be made with these strategies ($\pi_r = \pi_c = 0$). This implies that in equilibrium the difference between the call and put premiums for an option at an exercise price E will be equal to the difference between the forward exchange rate F and E, discounted to the market interest rate or:

$$C - P = (F - E)/(1 + i) \tag{4}$$

This relationship is called *put-call parity*. How close does it come to describing the relationship we see in reported option and forward prices? A complete answer requires a careful statistical study, but a rough idea can be obtained by seing how close the put-call parity theory comes to predicting the actual price differences between puts and calls on one of the Philadelphia Stock Exchange's most active contracts on a recent date. On July 17, 1984, at 10:11 a.m., calls on the Deutsche mark contract with a $.36 striking price and September expiration were trading for $318.75, while puts on that contract were trading for $631.25. These prices are the average bid-offer prices on recent trades, kindly provided by the Financial Options Group, Inc. A 2-month forward contract made on July 17th would be settled on the same date the options expired, and the average bid-offer rate on this contract posted by Citibank's New York office was $.3555. The 2-month CD rate, taken here to be a representative interest rate, was 11.63 percent, or 1.85 percent for 2 months.

Inserting the figures for the forward rate, the exercise price, and the interest rate into the put-call parity formula gives a predicted difference between the call and put premiums of − $276.14:

$$\begin{aligned} \text{Predicted } (C - P) &= [(F - E) \times 62{,}500]/(1 + i) \\ &= [(.3555 - .36) \times 62{,}500]/(1.0185) \\ &= -\$276.14 \end{aligned}$$

The difference between the forward price and the exercise price $(F - E)$ was multiplied by the number of Deutsche marks in the Philadelphia Stock Exchange's contract to put these prices in the same units as the premium.

The actual difference between the call and put options on July 17th was − $312.50. So the parity formula used with market data gives a close prediction of what the relationship among call, put, and forward prices was on the date. Could traders have executed reversals and conversions at the time the market data were taken to profit from the price difference? The answer is no: inserting the appropriate bid and offer prices into the reversal condition formulas (equations (2) and (3)) revealed no profit opportunities. In addition, the formulas do not take brokerage costs—which are on the order of $13 to $16 per option—into account. At the time the market data were collected, the September Deutsche mark option with a $.36 striking price was not mispriced relative to the forward market.

The Return Banks Have Paid on NOW Accounts

*Herb Taylor**

INTRODUCTION

Since their nationwide introduction on December 31, 1980, NOW accounts have become a popular alternative to personal checking accounts and small savings accounts.[1] This is not surprising, since NOWs are a hybrid of checking and savings accounts: they offer households an account against which they can write checks while earning interest on their average balances. But how much are depository institutions actually paying on NOW accounts? And how does this rate compare with the rates these institutions pay on the personal checking and regular savings accounts that NOWs seem to be replacing?

The interest rates banks explicitly promise to pay on these accounts are easy enough to compare. Most institutions offer, as the ads say, the "maximum rate allowed by law." And currently regulatory ceilings allow banks and thrifts to offer up to 5½ percent on savings accounts, 5¼ percent on NOW

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[1] According to the Fed's Demand Deposit Ownership Survey, consumers held roughly $88.2 billion in demand deposits (regular checking accounts) in December 1982. For the same month, other checkable deposits, which are primarily NOW accounts, stood at $104 billion.

accounts, and 0 percent on regular checking accounts. But in addition to explicit interest, banks often pay their depositors what is called "implicit interest," by offering them various goods and services at below cost. If we take implicit interest into account, comparing rates of return becomes more difficult because implicit interest is more difficult to measure.

One of the most popular techniques for estimating the implicit interest banks pay on customer deposits uses data from the Functional Cost Analysis (FCA), a detailed survey of banks' expenses and revenues compiled each year by the Federal Reserve (Fed).[2] FCA data allow us to construct estimates of both the explicit and the implicit interest rate that banks have been paying on checking accounts, savings accounts, and NOW accounts. The FCA-based estimates suggest that the average total return did not differ that greatly among the three accounts in 1981 and 1982, the first two years of the nationwide NOW experience. These estimates also indicate how decisions by both banks and households figure into the implicit interest rate actually paid on the different types of deposits.

THE RETURN BANKS PAY ON DEPOSITS

For over 50 years, regulatory ceilings have limited the explicit interest rates that commercial banks and thrift institutions could offer on various kinds of deposits. The Banking Act of 1933 prohibited commercial banks from paying any explicit interest at all on demand deposits. That Act also established Regulation Q under which the Fed set legal ceilings on the explicit interest rates commercial banks could pay on time and saving deposits. In 1966, similar ceilings were imposed on thrift institutions. Regulation Q interest rate ceilings have been raised only modestly over the last fifteen years. For example, in 1966 commercial banks were permitted to pay up to 4 percent interest on savings accounts and thrift institutions up to 4½ percent. When the ceilings were last raised in early 1984, commercial banks and thrifts were permitted to offer up to 5½ percent on savings accounts. When NOW accounts first were authorized in New England in 1972, depository institutions could offer up to a 5 percent explicit interest rate on them. When NOWs went nationwide in December 1980, the interest rate ceiling was raised to 5¼ percent.[3]

The long-standing prohibition against paying explicit interest on demand deposits and, more recently, the relatively low Regulation Q ceilings on explicit interest rates for regular savings accounts have forced banks to rely on implicit interest to attract these kinds of deposits. The implicit interest a bank offers its household customers may take a variety of forms. Offers of free household items—toasters, blankets, dishes—are perhaps the most obvious. But more routinely a bank pays implicit interest by offering its customers the product in which it specializes—financial services—at a price below the bank's cost of producing those services. Both checking and savings accounts offer banks opportunities to pay implicit interest in this way.

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[2] A comprehensive study of the implicit interest paid on demand deposits based on the Functional Cost Analysis data through 1976 is in Richard Startz, "Implicit Interest on Demand Deposits," *Journal of Monetary Economics* 5 (1979), pp. 515-534. Notable studies taking alternative approaches to estimating implicit interest on demand deposits are by Robert J. Barro and Anthony Santomero, "Household Money Holdings and the Demand Deposit Rate," *Journal of Money Credit and Banking* (May 1972), pp. 397-413, which uses survey data collected by the authors, and Benjamin Klein, "Competitive Interest Payments on Bank Deposits and the Long Run Demand of Money," *American Economic Review* 64 , (December 1974), pp. 931-949, which assumes that banks always pay a competitive rate. A useful discussion and summary of work in this area is in Michael Klein, "The Implicit Deposit Rate Concept: Issues and Applications" Federal Reserve Bank of Richmond *Economic Review*, 64 (Sept./Oct. 1978), pp. 3-12.

[3] NOWs first were issued in 1972 by mutual savings banks in Massachusetts and New Hampshire as an attempt to compete more effectively with commercial banks for households' deposits. The new accounts were not particularly popular at first, but gradually they caught on, and by 1980 the authority to issue NOWs had been extended to commercial banks and thrift institutions in all the New England states, New York, and New Jersey. Then, in December 1980, as a step toward the removal of the Regulation Q interest rate ceilings as mandated by the Monetary Control Act, all commercial banks and thrifts in the nation were given permission to offer NOW accounts. For further details, see the Federal Reserve Bank of Boston's *The NOW Account Experience in New England*, (1981), which includes relevant articles originally published in various issues of their *New England Economic Review*. For an overall analysis of the early New England NOW account experience, see Joanna H. Frodin and Richard Startz, "The NOW Account Experiment and the Demand for Money," *Journal of Banking and Finance* 6 (1982), pp. 179-193.

A household maintains a checking account with a bank because of the transactions services associated with it. The checking account provides a safe way to collect and store the funds that the household receives in various transactions, and a quick and convenient way to use the funds in additional transactions when the household decides to purchase either goods and services or other financial assets. Providing these transactions services is not costless; banks must devote real resources to accepting deposits, processing and clearing checks, handling currency, maintaining account records, and so forth. A bank can pay implicit interest to its checking account customers by providing these transactions services without charging them the full cost of the requisite resources. The bank may, for example, give customers free checks; it may set per check charges below the costs of processing and clearing a check; it may mail out monthly statements and cancelled checks without charge; it may accept deposits and allow cash withdrawals without charge; it even may make such transactions less time-consuming for the customer by providing more neighborhood branches and extra teller windows.

Regular savings accounts are not "checkable"—that is, the account holder cannot write checks transferring ownership of some portion of the funds in the account to a third party—so these accounts cannot be used to make purchases directly. Still, a savings account offers the depositor a relatively convenient asset in which any amount of funds, large or small, can be stored safely, and from which any portion of the funds, large or small, can be withdrawn quickly. As with checking accounts, banks use up real resources to produce the conveniences associated with savings accounts. And, likewise, banks have at least some opportunity to pay implicit interest on savings accounts by providing services at below cost.

NOW accounts are checkable, so banks can offer households the same implicit interest on NOWs as on regular checking accounts. But banks also may pay nearly the same explicit interest rate on NOWs as on regular savings accounts. Did banks wind up offering NOW account holders the best of both worlds: the same implicit interest as on regular checking accounts plus the maximum allowable explicit interest rate? Or did banks offer NOW account holders less implicit interest than on regular checking in exchange for an explicit interest rate closer to that on regular savings? These are the questions we put to the Functional Cost Analysis data.[4]

MEASURING RATES OF RETURN ON HOUSEHOLDS' DEPOSITS FROM THE FCA DATA

Functional Cost Analysis is a voluntary program developed by the Fed to help banks assess the performance and profitability of their various operations. Each year, the participating banks fill out a standardized set of reports detailing the expenses they have incurred and the revenues they have generated in performing specified functions. These functions correspond to various asset and liability categories on the banks' balance sheets. On the liabilities side, banks are asked to estimate annual costs and revenues associated with providing demand deposits and savings deposits to their customers. Within these two classifications, banks may break down their costs and revenues into those associated with personal checking accounts, regular savings accounts, and NOW accounts, among others.[5] The expenses on these accounts are divided into what are called "interest" and "non-interest" expenses, so the FCA data can be used to estimate the average explicit and implicit return banks pay on these accounts.

Estimating the average explicit interest rate banks paid on a particular type of account is straightforward. Banks' average interest expense per account is divided by the average outstanding balance per account.

Estimating the average implicit rate banks pay

[4]Generally, we would not expect depositors to view explicit interest and implicit interest as equally desirable. In principle, depositors would tend to prefer explicit interest payments—which they can use to purchase whatever set of goods and services they choose—over implicit interest payments—which they must consume in the form of the financial services or promotional products offered. But income tax considerations tend to favor implicit interest payments—which are not taxed—over explicit interest payments—which are taxed.

[5]Banks cannot break down all of their expenses precisely among the various types of accounts. They may allocate some of their overall deposit expense to a particular type of account on the basis of its proportion of total deposits or of total transactions, or on the basis of a survey of typical account activity. When a reporting bank does not allocate all of its costs, the FCA program does so according to historical and average bank patterns.

on a particular type of account requires two steps. First, take average "non-interest," or operating, expense banks incurred per account, and subtract the average revenue banks received in service charges per account. This difference measures the average implicit interest payment banks made per account. Second, divide this implicit interest payment by the average account balance to obtain the average implicit interest rate banks paid. So, for each type of account, the average implicit rate is measured as:

$$\text{Implicit Interest Rate} = \frac{\left(\begin{array}{c}\text{Non-Interest}\\ \text{Expense per Account}\end{array}\right) - \left(\begin{array}{c}\text{Customer Charges}\\ \text{per Account}\end{array}\right)}{\text{Average Balance per Account}}$$

The sum of the average explicit interest rate and implicit interest rate on each type of account represents the estimated total return on that type of account.

Comparing Total Returns. Available FCA data allow us to estimate the average rates of return on NOW accounts, regular checking accounts, and regular savings accounts from 1976 to 1982. The estimates, shown in Table 1, suggest that the explicit interest rate ceilings on these accounts have not been good indicators of their total rates of return.

The total return on NOW accounts has been relatively stable at about 7 percent over the sample period. Each year, this roughly 7 percent return on NOWs has been comprised of an average explicit interest rate near the 5 percent to 5¼ percent regulatory ceiling and an implicit interest rate within a few basis points of 2 percent.

The total return on households' regular checking accounts has persistently fallen below that on NOW accounts, but the difference between the two rates has been far less than the 5 percent to 5¼ percent advantage NOWs have in allowable explicit interest. In fact, in 1981 and 1982, the first two years that NOWs were authorized nationwide, the spread between the total returns on the two accounts narrowed to less than 1 percentage point. So banks have been paying an implicit interest rate on regular checking accounts nearly 4¼ percentage points higher than the implicit rate on NOWs.

The total return on regular savings accounts has risen steadily from about 6 percent, roughly 1 percentage point below the average NOW account rate, in 1976, to about 8 percent, roughly 1 percentage point over the average rate on NOWs, in 1982. As with NOWs, the average explicit interest rate on regular savings accounts has remained close to the Regulation Q ceiling rate. The difference in total rates of return has been the steadily rising implicit interest rate on regular savings accounts, which contrasts with the relatively flat performance of the implicit interest rate on NOWs.

The FCA data suggest that since NOWs have gone nationwide their total rate of return has not differed substantially from the rates paid on regular checking and regular savings accounts. In fact, during 1981 and 1982, the average rate of return on NOWs was just about halfway between the average rates of return on the two older types of accounts. But the FCA estimates also raise some interesting questions. How did banks manage to pay such a high implicit interest rate on regular checking accounts and such a low implicit rate on NOWs when both are checkable type deposits? And how did banks come to pay a higher implicit rate on regular savings accounts than on NOW accounts when savings accounts are not checkable? To help answer these questions it is useful to look at what determines the average implicit interest rates on these accounts: banks' average expenses per account, banks' average customer service charges per account, and customers' average balances per account.

COMPARING IMPLICIT RATES ON NOWs AND REGULAR CHECKING ACCOUNTS

Since the implicit rate on NOWs is so much lower than that on households' regular checking, it is tempting to conclude that NOW account holders have treated NOWs more like savings accounts than checking accounts, and so have used fewer transactions services than regular checking account holders. Or perhaps one might conclude that since banks are paying some explicit interest on NOWs, they have taken back some implicit interest by raising service charges to NOW account customers. But the FCA data support neither of these conclusions. First, NOW account customers have not, in fact, used appreciably fewer transactions services than regular checking account customers. It is true that banks' average expenses per NOW account (Table 2) have been

TABLE 1

AVERAGE RATES OF RETURN ON HOUSEHOLD DEPOSITS AT COMMERCIAL BANKS[a]

	NOW Accounts			Regular Checking Accounts[b]			Regular Savings Accounts		
Year	Total Return	Explicit Interest Rate	Implicit Interest Rate	Total Return	Explicit Interest Rate	Implicit Interest Rate	Total Return	Explicit Interest Rate	Implicit Interest Rate
1976	6.77%	4.89%	1.88%	5.37%	0%	5.37%	5.93%	4.79%	1.14%
1977	6.67	4.78	1.89	5.47	0	5.47	5.89	4.80	1.09
1978	6.87	4.84	2.03	4.82	0	4.82	6.12	4.85	1.28
1979	7.03	4.91	2.12	4.88	0	4.88	6.50	5.02	1.48
1980	6.78	4.92	1.86	4.61	0	4.61	7.09	5.13	1.95
1981	6.98	5.14	1.84	6.41	0	6.41	7.65	5.18	2.47
1982	7.11	5.21	1.90	6.35	0	6.35	8.04	5.17	2.86

[a]FCA reports average expenses, revenues, and balances data for small banks, medium size banks, and large banks separately. The published data were aggregated to compute the overall average figures presented here. See Appendix for details.

[b]Estimation of the implicit interest on households' non-interest-bearing checking accounts is complicated by the fact that banks report the personal checking account data for interest-bearing and non-interest bearing accounts combined. The estimates presented here are based on the assumption that the characteristics of the average interest-bearing account at the banks reporting personal checking account data are identical to those of the average NOW account at banks reporting NOW account data. See Appendix for details.

lower than their average expenses per regular checking account (Table 3) in each year of our sample, but the difference has been relatively small. So it seems that the average NOW account is nearly as active as the average checking account and uses up nearly as much in bank resources.[6] Second, banks have not, in fact, imposed higher service charges on NOW account customers than on regular checking account customers. Just the opposite is true. On average, banks have been imposing higher service charges on regular checking accounts than on NOW accounts. Furthermore,

[6]Persistent increases in average expense per account, both for regular checking and for NOWs, suggest households have been increasing their usage of checkable account services. Various measures of account activity, such as the average number of checks drawn per account and average number of deposits per account, published as part of the FCA data, confirm this pattern.

TABLE 2

IMPLICIT INTEREST PAID ON NOW ACCOUNTS AT COMMERCIAL BANKS

Year	Non-Interest Expense per Account	—	Customer Charges per Account	=	Implicit Interest Payment per Account	÷	Average Balance per Account	=	Implicit Interest Rate
1976	$ 53.47		$ 3.78		$49.69		$2637.20		1.88%
1977	53.36		5.80		47.56		2521.84		1.89
1978	59.88		4.82		55.06		2713.15		2.03
1979	72.04		10.16		61.88		2920.02		2.12
1980	77.21		8.86		68.35		3682.38		1.86
1981	86.87		7.68		79.20		4300.85		1.84
1982	106.34		10.90		95.44		5029.83		1.90

NOTE: See the Appendix for details of data and calculations.

these higher service charges more than compensate for the slightly higher expense banks incur on the regular checking accounts. In six of the seven sample years, the implicit interest payment banks made on the average household's regular checking account was lower than the implicit interest payment they made on the average NOW account. And the gap between the two implicit interest payments has been widening, because banks have persistently increased the service charges on regular checking, while keeping the customer charges on NOW accounts relatively low.

Despite making lower implicit *payments* on households' regular checking accounts, banks have paid a higher average implicit interest *rate* on these accounts than on NOWs simply because the average balance the checking account holders maintain is so much lower than the average balance the NOW account holders maintain. Over our seven-year sample the outstanding balance in the average NOW account roughly doubled, growing from about $2,500 per account in 1976 and 1977 to $5,000 per account by 1982. As a result, the approximate doubling in the average implicit interest payment on NOWs, from just under $50 in 1976 to just under $100 in 1982, has simply kept the implicit rate on NOWs constant at about 2 percent. Meanwhile, the average balance in a household's regular checking account has shown little sustained growth, fluctuating only modestly around its $1,050 per account average. So, even though the implicit interest payments on households' regular checking account balances have grown only half as fast as those on NOW account balances over the seven-year period, the implicit interest rate on regular checking has been relatively high and recently has been rising.

Average balances make the difference. The

TABLE 3

IMPLICIT INTEREST PAID ON INTEREST-BEARING PERSONAL CHECKING ACCOUNTS AT COMMERCIAL BANKS

Year	Non-Interest Expense per Account	—	Customer Charges per Account	=	Implicit Interest Payment per Account	÷	Average Balance per Account	=	Implicit Interest Rate
1976	$ 61.50		$13.11		$48.39		$ 901.18		5.37%
1977	66.05		16.07		49.99		914.28		5.47
1978	65.66		17.19		48.47		1005.03		4.82
1979	75.04		18.98		56.06		1149.23		4.88
1980	79.30		23.61		55.69		1206.85		4.61
1981	100.13		33.26		66.87		1043.39		6.41
1982	107.12		35.53		71.59		1127.93		6.35

NOTE: See the Appendix for details of data and calculations.

wide disparity in average balances between households' regular checking accounts and NOW accounts may reflect a number of factors, but at least in part it points up an important distinction between explicit and implicit interest.[7] When a bank offers its customers explicit interest it is giving them an incentive to maintain larger account balances, because the amount of interest the bank pays them depends on the amount of funds they keep in their account. If a bank offers its customers 5 percent interest on their NOW accounts, then every time a customer adds a dollar to his average balance for the year, he earns an additional $.05 interest. But when a bank offers to pay its customers implicit interest, it creates no incentive for them to maintain large accounts, because the amount of interest the bank pays them depends on how much they use their account, not on the amount they keep in it. If a bank pays its customers implicit interest by offering them free checking, then the customer does not get any more interest when he adds a dollar to his account; he gets more interest when he writes another check. So holders

[7] Depository institutions can influence the average balances held in accounts of a certain type by setting minimum average balance requirements for free or reduced price services. The FCA data provide no direct information on minimum balance requirements at participating institutions. "The Maturing of the NOW Account in New England," by Ralph C. Kimball, which is reproduced in *The NOW Account Experience In New England*, provides some data which strongly indicate that minimum average balance requirements on NOWs raise the average account size, but the magnitude of this effect is difficult to assess.

of regular checking accounts, which pay only implicit interest, have no incentive to hold any more than the bare minimum needed for transactions in their accounts. But holders of NOW accounts, which pay explicit as well as implicit interest, have the incentive to hold higher average balances.

Banks' realization that the average balances in households' regular checking accounts have tended to stagnate at a relatively low level may lie behind their decision to impose heavier and heavier service charges on these accounts, as we observe banks doing over the last several years of our sample. Given the increasing average cost of providing services on these accounts, banks seem to have raised customer charges in order to limit the implicit rate of interest they wind up paying on households' regular checking accounts.

COMPARING THE IMPLICIT RATE ON NOW ACCOUNTS AND REGULAR SAVINGS ACCOUNTS

Households' decisions about how much to hold in various deposit accounts also explain our seemingly paradoxical finding that recently banks have been paying a higher implicit rate on regular savings accounts, which are not checkable, than on NOW accounts, which are checkable.

We would expect that it costs banks less to provide the services associated with regular savings accounts than to provide those associated with regular checking accounts and NOW accounts. The FCA data bear this out: banks' non-interest expenses on regular savings accounts (Table 4) average less than half those on checkable accounts. Nonetheless, banks' average expenses per regular savings account have been rising, particularly in the last three years of the sample, reflecting more active account usage by customers. In fact, as with the checkable accounts, banks' expenses per savings account have roughly doubled over the sample period. Meanwhile banks have kept the average service charges on regular savings accounts at negligible levels. So, as with NOW accounts,

TABLE 4

IMPLICIT INTEREST PAID ON REGULAR SAVINGS ACCOUNTS AT COMMERCIAL BANKS

Year	Non-Interest Expense per Account	—	Customer Charges per Account	=	Implicit Interest Payment per Account	÷	Average Balance per Account	=	Implicit Interest Rate
1976	$21.57		$.00		$21.57		$1885.20		1.14%
1977	22.51		.00		22.51		2068.13		1.09
1978	26.73		.00		26.73		2096.78		1.28
1979	26.73		.24		26.49		1793.16		1.48
1980	30.74		.37		30.36		1555.47		1.95
1981	37.24		.74		36.50		1480.53		2.47
1982	42.61		.73		41.89		1462.71		2.86

NOTE: See the Appendix for details of data and calculations.

banks have passed nearly all of the value of the increased financial services on regular savings accounts through to their customers as increased implicit interest *payments*. The reason that the implicit *rate* of interest on regular savings accounts has been rising, while that on NOWs has remained flat, is the difference in average balances. While NOW account holders have roughly doubled their average account balance over our sample period, regular savings account holders have been reducing their average balance. Between 1978 and 1982, average balances in regular savings accounts fell by 30 percent from nearly $2,100 to just under $1,500.

The declining average balances in regular savings accounts between 1978 and 1982 probably reflect the impact of rising market interest rates on households' decisions about how to allocate their savings. Rising average expenses per regular savings account may reflect the same influences. Market rates above the ceiling interest rate offered on regular savings deposits tended to draw off the deposits of households who had enough funds to meet the minimum dollar requirements on instruments bearing market interest rates and were willing to forgo the greater liquidity offered by regular savings deposits. So the savings accounts which remained tended to be those with smaller average balances and those whose holders took greater advantage of the financial services that savings accounts offer. The combination of smaller average balances and larger average expenses per account worked to raise the average implicit rate of return on regular savings accounts.

CONCLUSION

Since December 31, 1980, commercial banks and thrift institutions across the country have been permitted to offer NOW accounts to their household depositors. An analysis of the FCA data on commercial banks' expenses suggests that since that time banks have paid NOW account customers a total rate of return close to the total rate of return paid on regular checking and on regular savings accounts. NOW account holders are receiving close to the maximum allowable explicit interest rate but a lower implicit interest rate than on regular checking accounts. In fact, the data indicate that the breakdown between explicit and implicit interest in NOWs' total rate of return is close to the breakdown between explicit and implicit interest in the total return on savings accounts. But it would be a mistake to infer from these results that households have been treating NOWs as savings accounts, or that banks decided unilaterally to pay a much lower implicit rate on NOWs than on regular checking. The numbers behind our implicit interest rate estimates tell a different story.

The implicit interest rate banks wind up paying on a particular type of account depends on the interaction between banks and their depositors. In particular, the rate depends on the amount of financial services that banks offer and account holders use, the charges banks impose on their customers for those services, and the average balances the account holders maintain. FCA data on banks' non-interest expenses and customer charges indicate that during 1981 and 1982, the average NOW account customer used roughly the same amount of financial services as the average household with a regular checking account. And since NOW account customers paid less for those services, they actually received larger implicit interest payments than the regular checking account holders. Holders of regular savings accounts received fewer financial services than holders of either NOWs or regular checking accounts. Yet the implicit rate paid on NOW accounts was far below the implicit rate paid on regular checking and even a bit below the implicit rate paid on regular savings. Why? The explanation lies with differences in average balances: Households have held much larger average balances in NOW accounts than in regular checking or savings accounts.

APPENDIX

Banks participating in the FCA program may report figures for a number of deposit categories. The categories used here were NOW accounts (referred to in some FCA tables as "Interest Bearing Checking Accounts" since banks may also include other checking accounts on which they pay interest), personal checking accounts (which include both interest-bearing and non- interest-bearing checking accounts owned by households and individuals), and regular savings accounts. When a bank chooses to report on a particular type of account, it indicates the number of such accounts it had outstanding and the total deposits held in them, its total interest expense and total non-interest expense on the accounts, and its total customer charges on the accounts. Based on this data, the FCA program publishes, for each type of account, the average figures of participating banks in three size classifications: small banks (less than $50 in deposits), medium-size banks (deposits between $50 and $200 million), and large banks (over $200 million in deposits).

In order to obtain the average estimates for all participating banks reported here, a weighted average of the figures for banks in the three size categories was taken, using the number of banks in each category to construct the weights. Then, for each type of account, the estimates of the average banks' total deposits, total interest and non-interest expenses, and total customer charges were divided by our estimate of the number of accounts held at the average bank in order to obtain estimates of the average account size, and the average interest expense, non-interest expense, and customer charges per account.

One additional difficulty in using the FCA data is that personal checking accounts include both the interest-bearing and the non-interest-bearing types. So the reported personal checking data on total deposits, the number of accounts, non-interest expense and customer charges (denoted D_{PC}, N_{PC}, X_{PC} and C_{PC} below) contain an interest bearing and non-interest bearing account components:

$$(1) \quad D_{PC} = D_{IPC} + D_{NPC}$$

$$(2) \quad N_{PC} = N_{IPC} + N_{NPC}$$

$$(3) \quad X_{PC} = X_{IPC} + X_{NPC}$$

$$(4) \quad C_{PC} = C_{IPC} + C_{NPC}$$

Banks' total interest expense on personal checking accounts (I_{PC}), of course, stems only from the interest-bearing type:

$$(5) \quad I_{PC} = I_{IPC}$$

In order to isolate the figures for the non-interest-bearing personal checking accounts (D_{NPC}, N_{NPC}, X_{NPC} and C_{NPC}) estimates of the interest-bearing components of the personal checking figures (D_{IPC}, N_{IPC}, X_{IPC} and C_{IPC}) were constructed. This was done by assuming that the interest-bearing personal checking accounts held at banks reporting personal checking account data had exactly the same characteristics as the NOW accounts held at banks reporting NOW account data.

First, it was assumed that interest-bearing personal checking accounts paid the same explicit interest rate as NOWs at FCA reporting banks, denoted i_{NOW} below. Under this assumption the explicit interest paid on personal checking simply represents the interest rate on NOWs times outstanding balances in interest-bearing personal checking:

$$(6) \quad I_{PC} = i_{NOW} \cdot D_{IPC}$$

Equation (6) can be rearranged to produce an estimate of interest- bearing personal checking deposits:

$$(6') \quad D_{IPC} = (I_{PC} / i_{NOW})$$

Next, we assume that the average balance held in an interest-bearing personal checking account is the same as the average balance held in a NOW account at FCA-reporting banks, denoted a_{NOW} below. Since total

interest-bearing personal checking deposits can be written as the number of these accounts times the average balance per account, we have:

(7) $D_{IPC} = a_{NOW} \cdot N_{IPC}$

Equation (7) can be rearranged, and combined with (6') to produce an estimate of the number of interest-bearing personal checking accounts:

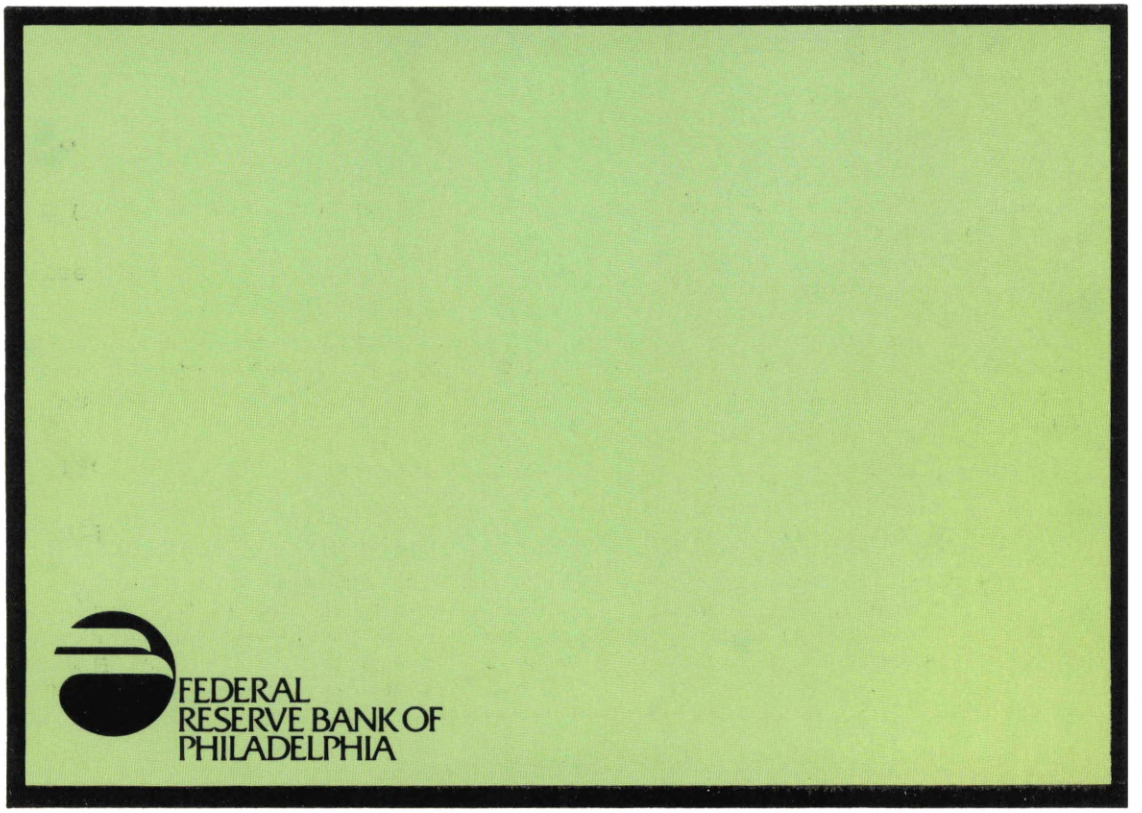
(7') $N_{IPC} = D_{IPC} / a_{NOW} = (I_{PC} / i_{NOW} \cdot a_{NOW})$

Finally, we assume that per account bank expenses and customer charges on interest-bearing personal checking accounts are the same as per account expenses and charges on NOW accounts (denoted x_{NOW} and c_{NOW} respectively). Then we can total expenses and customer charges on interest-bearing personal checking, using (7'), as:

(8) $X_{IPC} = x_{NOW} \cdot N_{IPC} = (x_{NOW} \cdot I_{PC} / i_{NOW} \cdot a_{NOW})$

(9) $C_{IPC} = c_{NOW} \cdot N_{IPC} = (c_{NOW} \cdot I_{PC} / i_{NOW} \cdot a_{NOW})$

In short, the estimates of total deposits, the number of accounts, the total expenses, and the customer charges associated with interest-bearing personal checking are given by equations (6'), (7'), (8) and (9) respectively. These estimates are then subtracted from the total personal checking figures to obtain estimates of non-interest-bearing personal checking deposits, the number of these accounts, and the total expenses and customer charges associated with them. From these estimates the implicit interest on regular checking accounts in the text is computed.



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Address Correction Requested