by Nils H. Hakansson

The Purchasing Power Fund:
A New Kind of Financial Intermediary

◂ This article introduces a fundamentally new kind of intermediary (called a purchasing power fund) offering a fundamentally new kind of financial instrument (called supershares). Supershares differ from all previously issued financial instruments in that (1) they provide a payoff only for a prespecified level of the market return over the period between issue and maturity and (2) the payoff can be denominated in real (i.e., deflated) terms.

The underlying assets of the fund are managed like an index fund. The range of possible outcomes, expressed as a return on the initial value of the assets, is finely divided, and a particular kind of supershare assigned to each division. On the maturity date the supershare corresponding to the actual outcome pays off; the others become worthless.

By purchasing the appropriate mix of various kinds of supershares, an investor can purchase the equivalent of a mutual fund share, a purchasing power bond, a levered position in a mutual fund, a short position in a mutual fund, a call or a put—and all without borrowing either shares or money. ▸

Life is really simple, but men insist on making it complicated. —*Confucius*

TO MOST people, the term "financial markets" denotes the market for stocks and bonds. But others would interpret financial markets more broadly to include the market for options, insurance, commodities, savings accounts, mortgages and consumer loans in general. In any case, there is general agreement that financial markets provide a mechanism through which an investor can change the form of wealth that he holds.

Even though all national wealth (real wealth) is ultimately owned by individuals and families, only a fraction of that wealth (in particular, the nonpersonal wealth) is owned directly. Most ownership by individuals and families is indirect, via ownership in the nation's economic units (i.e., its partnerships, private organizations, governmental units and corporations) which in turn own the real assets. This ownership is represented by claims issued by the direct owners; many of these are explicit while others are unwritten and implicit. The written claims are generally tradeable while the implicit ones are untradeable. Stocks, bonds, commercial notes, warrants, commodity options and paper money are examples of tradeable claims; they are often referred to as financial assets or financial instruments.

Other things equal, the more variety a nation's financial markets offer, the better off that nation's individuals are. There is a direct relationship between the economic welfare of the nation's individuals and families and the variety of instruments actively employed in its financial markets.[1]

Financial assets add flexibility to the form in which the nation's wealth can be held in that they implement division of that wealth into many more components. This type of flexibility is particularly important when returns to scale induce the establishment of large economic units. The desire for flexibility in asset holdings has in fact been so strong that it has led to the establishment of financial intermediaries whose main function is the creation of new types of claims based on pools of claims issued by di-

1. Footnotes appear at end of article.

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rect owners of real wealth (i.e., by individuals, partnerships, private organizations, governmental units and corporations).

The desire for variety in a nation's wealth-holding possibilities shows up in other ways as well. Recently, direct owners of real wealth, particularly corporations, have begun to issue new kinds of instruments themselves (warrants, convertible preferred stocks, convertible bonds, etc.), instruments that provide increased flexibility for investors. Option markets offer additional flexibility.

Where does the process of adding new financial markets stop? In a classic paper, Professor Kenneth Arrow demonstrated that the process will stop when we reach what is known as a "complete" financial market.[2] In a complete market, investors have the opportunity to alter their exposure to every contingency. As a practical matter, no one knows for sure what a complete market is, or when it will be reached, especially in the presence of transaction costs. But it is reasonably clear that we still have a long way to go. We will continue to move toward a complete market by adding even more financial instruments. Unfortunately, in adding new instruments we are drastically increasing the information demands placed on investors.

Is there a way to add important new flexibility to the ways in which the nation's wealth can be held? That is, can we add significantly to market variety *without* adding too many new instruments, while at the same time limiting information demands on the investor?

This article introduces a fundamentally new type of financial instrument—one issued by a financial intermediary that, for lack of a better name, will be called a purchasing power fund (PPF). From time immemorial, financial instruments have exhibited two basic characteristics: (1) They have (individually and in portfolios) provided a positive payoff of some kind for all or most levels of return on the market as a whole and (2) the payoff has, with rare exceptions, been denominated in nominal units. The securities of a PPF, which will be referred to as supershares, differ from all previously issued financial instruments in that (1) they provide a payoff only for a prespecified level of the market return over some period and (2) the payoff is readily denominated in real (i.e., deflated) terms.

The *ex post* return on the market has become the yardstick against which more and more large and small investors measure their own investment performances. Representing the average return, it is simple, intuitive and meaningful; moreover, it is something achievable, at least gross of transaction costs and for sizeable portfolios. But the enormous growth in beta analysis reflects the increasing role of the market return in *ex ante* settings as well.[3] By his choice of beta, the investor knows roughly, and has some control over, how his portfolio will do, *given* the return on the market. But present instruments only enable the investor to multiply the return on the market by a constant factor (by choosing a $\beta > 1$ or $\beta < 1$). He cannot, for example, readily choose a portfolio that does better than the market if the market return is less than or equal to 20 per cent or worse if the market is up more than 20 per cent, and he cannot go short in the market without foregoing all return on the proceeds and on his margin, etc.

Nor is there at present any way for the average investor to cope effectively with, or hedge against, inflation. It is, of course, true that various countries have provided indexed bonds, also known as purchasing power bonds (e.g., Brazil, Finland, Israel). But it is noteworthy that these indexed purchasing power instruments are fixed obligations. There exist, to my knowledge, no indexed purchasing power instruments of the equity type. Although stocks in general have long been thought of as a hedge against inflation, many have questioned their effectiveness in this regard. But even if common stocks were in some rough sense a reasonably good hedge against inflation, the investor would face certain difficulties in choosing an appropriate portfolio in terms of deflated return distributions. He would, in effect, have to estimate both the nominal return on his portfolio *and* the inflation rate and then divide the first random variable by the latter. The return he expects will depend in some way on companies' real profitability. But profitability is a function of revenues and costs and they in turn depend in a nontrivial way on the level of inflation. The net result of this is that there is in fact no direct way to hedge against inflation with present financial instruments.

One can, of course, always blame the government for creating inflation. While this generally places the blame where it belongs, it doesn't solve the problem, and replacing the administration does not seem to help either. Where does this leave the investor? In the Old West, when the government was too far away to offer adequate protection, the citizenry sometimes took the law into their own hands. In the same way, the time seems ripe for the financial community to take on the problem of inflation. To accomplish this, it must provide financial instruments that enable investors who wish to bear real risk to make their own choices on a real return basis. Shares in the PPF are such instruments.

The Purchasing Power Fund Concept

A purchasing power fund is a financial intermediary. As such, it combines the main features of our principal contemporary intermediaries: Like banks, it

does a great deal of risk pooling and issues entirely new instruments; it provides, like insurance companies, a multitude of novel risk-sharing arrangements; like investment funds, it provides diversification by simple means. A PPF adds substantial variety to the financial market (in terms of the choices it makes possible for investors) with relatively few instruments, particularly in relation to the variety obtained with a similar number of conventional convertibles and options. It enables the investor directly to choose the risk he wishes to bear in real terms as opposed to nominal terms. And the investor knows almost exactly what kind of real return he will have for an important, simple and meaningful (mutually exclusive and exhaustive) set of contingencies. Finally, the instruments issued by the PPF have a fixed maturity or sequence of maturities (in order to make the preceding possible) and the fund is, for reasons that will become clear later, best left "unmanaged." The ultimate purpose of the PPF, simply stated, is to provide large and small investors with a simple and versatile means of directly investing in their nation's economy.

An Example

Table I presents the balance sheet of a PPF with, for illustrative purposes, initial assets of $10 million. The asset side would contain, say, 100 to 1000 of the more important stocks and bonds. It is not necessary for the fund to hold the same percentage of the outstanding supply of each item in its portfolio, but it has several virtues: The PPF will then own a cross-section of the market, or the market portfolio, and will be particularly beneficial in terms of economic welfare.[4] Since all its assets are financial instruments, the PPF clearly qualifies as a financial intermediary.

Against its assets, the PPF has, in Table I, issued 111 mutually exclusive claims, all maturing on January 7, 1977. These claims are fundamentally different from the financial instruments on the asset side (as in a bank) and they are contingent on specific events (as in an insurance company). The claims are tied to 111 different possible events (one claim for each event), one, *and only one*, of which must, without ambiguity, happen on the maturity date. At maturity, all assets will accrue to one claim—the other 110 will, on that date, expire worthless. Thus the claims issued by the PPF are similar in nature to options.

The specific events to which the claims are keyed are the possible percentage changes in the value of the fund's total assets from the date of issue to maturity. For example if, after adjusting for inflation, the asset side is still worth $10 million on Janu-

TABLE I: Purchasing Power Fund Maturing January 7, 1977, with 111 Types of Claims Outstanding

Pre-Opening Balance Sheet, January 5, 1976

Assets		Claims	
y% of outstanding supply of bond 1	b_1*	5,000,000 "–50%" shares payable Jan. 7, 1977, only if the deflated value of the assets is less than or equal to $5,050,000	c_1**
y% of outstanding suppy of bond 2	b_2		
.		5,100,000 "–49%" shares payable Jan. 7, 1977, only if the deflated value of the assets exceeds $5,050,000 and is less than or equal to $5,150,000	c_2
.		.	
y% of outstanding supply of bond m	b_m	.	
y% of outstanding supply of stock 1	s_1	.	
y% of outstanding supply of stock 2	s_2		
.		10,000,000 "0%" shares payable Jan. 7, 1977, only if the deflated value of the assets exceeds $9,950,000 and is less than or equal to $10,050,000	c_{51}
.		.	
.		.	
y% of outstanding supply of stock n	s_n	.	
		15,900,000 "59%" shares payable Jan. 7, 1977, only if the deflated value of the assets exceeds $15,850,000 and is less than or equal to $15,950,000	c_{110}
		16,000,000 "60%" shares payable Jan. 7, 1977, only if the deflated value of the assets exceeds $15,950,000	c_{111}
Total Assets	$10,000,000	Total Claims	$10,000,000

*At most recent closing market prices.
**At issue prices, prorated.

ary 7, 1977, the fund will have experienced a zero per cent real gain. The "zero per cent" supershares, therefore, pay off, and since there are 10 million such shares outstanding (see Table I), each "zero per cent" share receives one dollar in real terms (that is, $1.09 in actual money if the rate of inflation were nine per cent); all other supershares receive nothing. If, on the other hand, the fund experiences a 49 per cent real loss (i.e., the deflated value of the assets has fallen to $5,100,000 at maturity), the "–49 per cent" shares pay off (and no others). Since there are only 5,100,000 such shares outstanding, each share would again receive one dollar in real terms.[5]

The "x per cent" shares pay off if the real rate of return, rounded to the nearest per cent, is x per cent. Thus the "–24 per cent" shares pay off if the real rate of return exceeds –24.5 per cent and is less than or equal to –23.5 per cent. The payoff per share, therefore, need not be exactly one dollar but will range from roughly 99 cents to $1.01 per share, excepting the "extreme" shares (in Table I, the "–50 per cent" and the "60 per cent" shares).[6] The "–50 per cent" shares, for example, would pay 50 cents (and the others nothing) if the real rate of return on the fund's assets were –75 per cent, and the "60 per cent" shares would pay $1.50 if the real rate of return were 140 per cent.

Conditions for Payment of Claims

In the Table I example, the "x per cent" shares become payable at maturity if and only if

$$100 + x - 0.5 < \frac{m/b}{0.01\,(1+0.01i)} \leq 100 + x + 0.5,$$

$$x = -49,\ -48,\ \ldots.\ 59,$$

where "m" is the market value of the fund's assets at maturity, "b" is the opening market value of the fund's assets, and "i" is the rate of inflation based on the Consumer Price Index (or similar index).[7] The left side does not apply for the "–50 per cent" shares (x = –50) and the right side does not apply for the "60 per cent" shares (x = 60).

TABLE II: Payoff on "20 Per Cent" Shares

Increase in Nominal Market Value of Fund	Rate of Inflation	Proceeds Per Share	
		Actual Dollars	Real Dollars
14%	–5%	0.9500	1.0000
20%	0%	1.0000	1.0000
26%	5%	1.0500	1.0000
27%	6%	1.0583	0.9984
29.2913%	7.3%	1.0761	1.0029
31%	9%	1.0917	1.0015
32%	10%	1.1000	1.0000
38%	15%	1.1500	1.0000
44%	20%	1.2000	1.0000
50%	25%	1.2500	1.0000
etc.			

Suppose, for example, that over the term of a given set of supershares the assets of the fund decrease in value 26.4 per cent (i.e., m = $7,360,000 if b = $10 million) and the rate of inflation is 12.2 per cent.[8] In this case, the "–34 per cent" shares would pay off, since

$$\frac{7{,}360{,}000/10{,}000{,}000}{0.01\,(1+0.122)} \approx 65.5971\ .$$

Each share would receive 1.11515 actual (nominal) dollars (7,360,000 / 6,600,000), which translates into $0.9939 (1.11515 / 1.122) per share when deflated. The variety of conditions under which the "20 per cent" shares would pay off are illustrated in Table II.

Initial Supershare Prices: An Illustration

What can the investor do with a PPF that he couldn't do before? Table III gives a hypothetical initial price structure for supershares. Even though purely hypothetical (since supershares have no empirical counterpart at the present time), this price structure incorporates certain realistic aspects of investing. For example, built into the prices is a management/underwriting fee of 2.13 per cent. Note also that the shares corresponding to the more probable outcomes have higher prices: The "–15 per cent" to "25 per cent" shares cost more than the "–40 per cent" and "40 per cent" shares.

After the supershares are issued, one would expect a secondary market in supershares to develop in the same way that such markets develop for other widely held financial instruments. I will have more to say about secondary trading later; for the time being, however, I limit the discussion to the ramifications of full-term investment, although much of the analysis applies with equal force to positions acquired after the issue date.

Returning to Table III, we see that the "one per cent" shares cost three dollars per 100 or three cents apiece (recall that the "one per cent" shares will return something very close to one dollar in real terms if the real return on the fund's assets is within one-half per cent of one per cent). Similarly, the "–40 per cent" shares sell for five cents per 100, the "–20 per cent" shares for 80 cents per 100, the "20 per cent" shares for two dollars per 100, the "60 per cent" shares for a penny per 100, etc.

Suppose now that the investor considers buying 100 shares of each type. This means that he is almost sure to get back something very close to $100 in real dollars; in *any* contingency, 100 of his shares will pay off. And the payoff will be within one per cent of one dollar per share (except for the "–50 per cent" shares, which may pay less than one dollar, and the "60 per cent" shares, which may pay more than one

TABLE III: Hypothetical Initial Prices: One-Year Purchasing Power Fund with 111 Types of Shares Outstanding

Share Type	Price Per 100 Shares	Share Type	Price Per 100 Shares
–50%	$0.02		
:	:		
–46%	0.02		
–45%	0.04	1%	$3.00
:	:	:	:
–41%	0.04	10%	3.00
–40%	0.05	11%	2.00
:	:	:	:
–36%	0.05	20%	2.00
–35%	0.10	21%	1.00
:	:	:	:
–31%	0.10	25%	1.00
–30%	0.20	26%	0.50
:	:	:	:
–26%	0.20	35%	0.50
–25%	0.50	36%	0.20
:	:	:	:
–21%	0.50	40%	0.20
–20%	0.80	41%	0.12
:	:	:	:
–16%	0.80	45%	0.12
–15%	1.20	46%	0.05
:	:	:	:
–11%	1.20	50%	0.05
–10%	1.50	51%	0.02
:	:	:	:
–6%	1.50	55%	0.02
–5%	2.25	56%	0.01
:	:	:	:
0%	2.25	60%	0.01
Cost of 100 shares of all types			$97.55
Mean real rate of interest			2.51%
Range of real rate of interest*		1.49 to	3.53%
Cost of "mutual fund share" per $100 asset value			$102.13

*Assuming asset value does not decrease more than 50.5% or increase more than 60.5%.

dollar). Considering a real rate of return on the market portfolio of less than –50.5 per cent or more than 60.5 per cent is very unlikely, owning 100 shares of each type is like holding a promise to pay, or a virtually risk-free bond. Actually, it is more than an ordinary bond—it is a purchasing power bond or an indexed bond. Yet no government stands behind it, no corporation has had to promise the holder a nominal rate of interest *plus* the rate of inflation. It is a bond constructed by the investor himself; it is backed by a solid cross-section of the major financial instruments traded in the financial markets. Furthermore, the investor can buy the bond in any denomination he chooses.

The price of the bond is the sum of the prices of its components. Adding the prices shown in Table III, a "$100 bond" costs $97.55, a "$10,000 bond" $9,755. Thus the real rate of interest is essentially within one per cent of 2.51 per cent (100 (100/97.55–1)). Built into the price structure of every PPF with a sufficient number of different supershares, then, is a real rate of interest; in our illustration that rate, as noted, is approximately 2.5 per cent.[9]

How much would the PPF collect by selling all its supershares at the prices shown in Table III? This, of course, is a matter of simple arithmetic: For the $10 million fund in Table I it would sell five million "–50 per cent" shares at two cents per 100, 5.1 million "–49 per cent" shares at two cents per 100, ... and 16 million "60 per cent" shares at one cent per 100, yielding a total of $10,213,000. Since the assets "cost" $10 million, the Table III price structure indeed incorporates a 2.13 per cent management fee, as noted earlier. However, since the fund is essentially unmanaged, it may be more appropriate to refer to this fee as an underwriting fee.

Supershares: The "Chemical" Elements of the Mutual Fund Share

Can the investor buy a "regular mutual fund" share in the fund? Suppose an investor would like to invest $10,000 (plus the 2.13 per cent fee for a total investment of $10,213). If the fund were of the regular variety with one type of share outstanding, he would, using our previous $10 million fund as an illustration, end up holding 0.1 per cent of the fund's common shares. But by purchasing 0.1 per cent of *each* of the outstanding supershares (i.e., 5,000 of the "–50 per cent" shares, 5,100 of the "–49 per cent" shares, ..., 16,000 of the "60 per cent shares"), the investor would be in an identical position, no matter what happened. That is, no matter which supershare pays off, the investor is entitled to 0.1 per cent of the fund's net worth. If the fund's assets increase by 11.241 per cent, the investor's $10,213 investment would nominally be worth $11,241 whether he had bought a regular mutual fund share or the supershare package described earlier. The investor can always, on the basis of supershares alone, construct for himself a regular mutual fund share holding. (See Portfolio 1 in Table IV for further details.)

Water is composed of two elements, hydrogen and oxygen, in the combination H_20. Analogously, a regular mutual fund share can be thought of as being made up of elements—elements called supershares. The right side of the balance sheet in Table I is nothing less than the chemical formula of one million $10 par value mutual fund shares or five million two dollar par value mutual fund shares, etc. In this example, the formula involves 111 elements—shares in the PPF that are separately tradeable and separately priced.

Having learned the principles of chemical decom-

TABLE IV: Purchasing Power Fund: Illustrative Portfolios

#	Brief Description	Portfolio Construction	Cost[a]	Net Real Return on Investment[b] if Deflated "Market" Return is		
				–25%	5%	30%
1	Market portfolio	Buy 5,000 "–50%" shares, 5,100 "–49%," . . . , 10,000 "0%," . . . , 16,000 "60%" shares	$10,213	–26.6%	2.8%	27.3%
2	Risk-free portfolio	Buy 10,251 shares of each type	$10,000	2.5%	2.5%	2.5%
3	50-50 blend of market portfolio and risk-free portfolio	Buy 7,626 "–50%" shares, 7,676 "–49%," . . . , 10,126 "0%," . . . , 13,126 "60%" shares	$10,107	–12.2%	2.7%	15.0%
4	Market portfolio with 40% leverage	Buy 2,900 "–50%" shares, 3,040 "–49%," . . . , 9,900 "0%," . . . , 18,300 "60%" shares	$10,298	–37.9%	2.9%	36.9%
5	50% short position in market added to risk-free portfolio	Buy 12,877 "–50%" shares, 12,827 "–49%," . . . , 10,377 "0%," . . . , 7,377 "60%" shares	$9,893	17.5%	2.4%	–10.3%
6	Call on market with 0% exercise price	Buy 1 "1%" share, 2 "2%" shares, . . . 59 "59%" shares, 60 "60%" shares	$8.27	–100%	–39.5%	262.8%
7	Put on market with 0% exercise price	Buy 50 "–50%" shares, 49 "–49%," . . . , 2 "–2%," 1 "–1%" share	$3.69	577.5%	–100%	–100%
8	Fixed return if market goes up, nothing back otherwise	Buy 16,129 "1%" shares, 16,129 "2%," . . . , 16,129 "60%" shares	$10,000	–100%	61.3%	61.3%
9	Fixed return if market goes down, nothing back otherwise	Buy 30,030 "–50%" shares, 30,030 "–49%," . . . , 30,030 "–1%" shares	$10,000	200.3%	–100%	–100%
10	Fixed return if market return is between –25% and 30% inclusive, nothing back otherwise	Buy 10,989 "–25%" shares, 10,989 "–24%," . . . , 10,989 "0%," . . . , 10,989 "30%" shares	$10,000	9.9%	9.9%	9.9%
11	Fixed return if market goes up from 1% to 10% inclusive, money back otherwise	Buy 10,000 "–50%" shares, . . . , 10,000 "0%," 10,816 "1%," . . . , 10,816 "10%," 10,000 "11%," . . . , 10,000 "60%" shares	$10,000	0%	8.2%	0%
12	Bet on market going down 25%, money back otherwise	Buy 10,000 "–50%" shares, . . . , 10,000 "–26%," 59,000 "–25%," 10,000 "–24%," . . . , 10,000 "60%" shares	$10,000	490%	0%	0%
13	Bet on market going up 30%	20,000 "30%" shares	$100	–100%	–100%	19,900%

a. Based on Table III price structure.
b. Net of all costs (except taxes) if held from issue date to maturity date.

position, man has chosen to put the basic elements together in new arrangements, constructing useful synthetics such as nylon and various plastics. Knowing the chemical formula of the mutual fund share, the financial community has the same opportunity to offer investors fundamentally new products. In contrast to the physical scientist, however, the underwriter has almost complete freedom in the products he chooses to define. This is a blessing, of course, but also a burden since it necessitates careful choice.

Some Illustrative Supershare Portfolios

In Table IV, Portfolio 1 is the mutual fund holding we have already discussed. Portfolio 2 (also discussed earlier) may be thought of as the least risky portfolio constructable from supershares; its yield is within one per cent of 2.5 per cent, in real terms, if held to maturity. The important thing to remember is that the same elements that enable the investor to construct a risky mutual fund position also enable him to construct a virtually risk-free purchasing power bond—a kind of bond not available in most countries—by simply applying a different chemical formula.

Continuing in this fashion, the investor can, from the basic supershares, construct any linear combination of the previous portfolios—i.e., of the mutual fund holding (in this case the market portfolio) and the risk-free bond. The supershare formula for a 50-50 blend is shown in Portfolio 3 of Table IV.

Consider an investor with $10,000 (plus fees) to invest who wants a market portfolio holding on a 71 per cent margin—i.e., one who would like a $14,000 regular mutual fund position, financed with $4,000 of borrowing. If he could borrow at the lending rate (2.5 per cent) he would have to repay the lender $4,100 in real terms; this leaves him—if the return on the fund were –50 per cent, say—with (0.5 × 14,000) –4,100, or $2,900. If the fund went up 60 per cent he would end up with (1.6 × 14,000) –4,100, or $18,300 on a total investment of $10,000 plus 2.13 per cent of $14,000, or $10,298.

But with supershares available, the investor does not have to locate a reputable lender who is willing to lend him money at a rate less than or equal to the rate the lender pays for money. The investor can duplicate almost exactly the previous levered portfolio with long positions in selected supershares. With $10,298, he can afford to buy 2,900 "–50 per cent" shares, 3,040 "–49 per cent" shares, ..., and 18,300 "60 per cent" shares (see Portfolio 4 in Table IV).

In other words, supershares make it possible for investors to take levered positions *without actually borrowing*. No matter how terrible the investor's credit rating, he can borrow money at the rate he would get as a saver—without lender's approval, without the need to monitor his loan, without the risk of a margin call, without risk of default. The only money the investor can lose is his own.

Suppose an investor with $10,000 to invest desires a $5,000 short position in the market and the opportunity to invest the proceeds plus his own money (i.e., $15,000) in an indexed bond. This is rather difficult, if not impossible, to accomplish in present markets, where the proceeds from short sales plus a margin generally must be held in a nonearning escrow account. But it *is* possible, given a PPF. By an appropriate combination of long positions in the mutual fund share elements (see Portfolio 5 in Table IV), the investor can in fact "go short," with (implicit) full investment of the proceeds, without margin and therefore without risk of margin calls, and without risk of default. The chemical formula of a short position is no more complex nor more difficult than that of a long position in bonds. This being the case, the investor does not, as under present finance technology, have to forego the interest or other earnings on the proceeds and on his margin.[10]

At the present time, put and call options are attached to individual common shares only. The elements of a PPF basic share, however, can be used to construct puts and calls on portfolios—in real terms. Two such options on the market portfolio, with a "zero per cent" exercise price and an expiration date of January 7, 1977, are shown in Portfolios 6 and 7 of Table IV. While the expiration date must coincide with that of the supershares, the investor can easily buy calls and puts on the fund's real portfolio return at *any* exercise price. Such options are merely complex packages of the basic claims issued by the PPF. Note, also, that no writer of options is needed: Without being dependent on a specialized option trading floor, the investor himself can construct numerous options from the elements of the PPF's mutual fund share.

One way to place a bet on the market going up in real terms is to buy real return calls (see Portfolio 6 for an example). But there are many other ways to place such bets. For example, the investor can purchase a fixed real return contingent on the market portfolio going up any amount: Under the price structure in Table III, an investor would, with $10,000, be able to buy 16,129 of each of the "one per cent" to "60 per cent" shares, yielding him a 100 per cent loss if the real return on the market portfolio were 0.5 per cent or less or a 61.3 per cent real return on his investment if the real market portfolio return exceeded 0.5 per cent. Similarly, as Portfolio 9 shows, the investor would, under the Table III

price structure, be able to achieve a fixed real return of approximately 200.3 per cent on an investment focused entirely on the market portfolio going down 0.5 per cent or more in real terms. Portfolios 8 and 9 are examples of the multitude of investment positions, constructed from the elements of the PPF mutual fund share, that are virtually impossible to construct at the present time.

Table IV contains some additional examples based on the Table III price structure. Portfolio 10 shows that if the investor is willing to bet on the real return on the market falling between –25.5 per cent and 30.5 per cent, he can raise the real return on his investment to approximately 9.89 per cent by assuming the risk of 100 per cent loss if the fund's real return falls outside that range. Portfolios 11 and 12 illustrate how (in this case) 97.55 per cent of the investor's funds can be used to get his money back in real terms while he employs the remaining 2.45 per cent to achieve a positive return by betting on the one or more contingencies he considers most likely.

Finally, Portfolio 13 confirms that, considered individually, the elements of the mutual fund share are similar to lottery tickets: For a few cents, it is possible to obtain, with a small probability, a payoff very close to $100 (see Table III). The "30 per cent" shares, for example, cost 50 cents per 100, so that a $100 investment could conceivably be turned into $20,000. Thus, although primarily designed for serious investors, the supershares also offer opportunities for gambling. Note, however, that the gambling opportunities provided by the elements of the mutual fund share are in the nature of a favorable game—i.e., one in which the expected return is clearly positive (since it is directly tied to the return on the market portfolio). This is in sharp contrast to the more common gambling opportunities offered by state lottery tickets, casinos, horseracing and other betting pools, on which there is generally a substantial house take (often on the order of 20 per cent) and on which there are no earnings on contributed funds. To the extent that a PPF attracts gamblers, it can be viewed as performing a useful service, since it channels their capital into the productive activities undertaken by the economic units represented by the PPF's financial instruments, rather than into purely redistributive betting situations.

The preceding illustrations are perhaps sufficient to give some clues to the enormous range of choice the PPF offers the large or small investor. He can indeed "put his money where his beliefs are" with respect to the market as a whole. The elementary supershares give him greatly expanded flexibility in building the portfolio that suits him best.

The Simplicity of Investment Choice

For those who limit their investment to supershares, perhaps the most significant aspect of the PPF is the simplicity of the resulting investment choice: It could be compared to entering a supermarket with (in our example) 111 items on the shelves, all priced. The investor need only decide how to allot his available funds among these items. This decision requires only simple calculations like multiplication and addition. Clearly, his task is very much like that performed by ordinary shoppers every day. In any case, it seems simpler than constructing a portfolio of regular securities, which involves combining already complex packages of elements. In addition, with supershares the investor knows in advance what he will get conditional on something both intuitive and meaningful—namely, the realized real return on the market. This, of course, is not true in present markets: Portfolios composed of ordinary shares (other than index funds) offer their owners and managers no certainty regarding their real or nominal return.

Operating A PPF: Some of the Managerial Issues

So far, I have examined the PPF concept primarily through the eyes of the investor, or from the demand side. The managerial issues involved in floating and operating a PPF arise at four levels: (1) the determination of the issue and maturity dates of each battery of supershares to be sold, (2) the selection of the particular set of supershares to be issued, (3) the choice of assets to be held over each term, and (4) the joint determination of the size of the fund and how the supershares for each term are to be floated. The first three decisions are relatively straightforward and the fourth can also, at the option of management, be made fairly simply and with little risk exposure. Since management performs relatively few services, the full-term investors in supershares should enjoy relatively low transaction costs.

The Scope of Management Decisions

As to the term of each battery of supershares, management has complete flexibility—six months, a year, two years, three years, etc. More than one maturity can clearly be issued against the same asset base, but it is probably simpler (and more flexible) to have a separate PPF for each maturity. An annual PPF, for example, might issue supershares before the opening of business on each second Monday in January for a period ending at the close of business on Friday preceding the second Monday in January the following year.

Concerning the particular battery of supershares

to be issued, management again has an open-ended range of possibilities: It can issue anywhere from two supershares (one paying off if the asset side increases and the other if the assets decrease or remain unchanged in value, for example) to several hundred supershares. Loosely speaking, the more elements in the basic mutual fund share, the closer one can come to constructing a completely risk-free (in real terms) portfolio and the lower the price of each supershare. (The balance sheet in Table I clearly is just that—a more or less arbitrarily chosen example involving a uniform supershare density of one per cent and "–50 per cent" and "60 per cent" end-shares.) Management is free to choose a variable density and to place its end-shares wherever it wishes. However, since proliferation for its own sake offers no advantage, a reasonable objective would be to issue the minimum number of supershares consistent with the possibility of constructing an indexed bond that would, in the eyes of most investors, be viewed as essentially risk-free. The PPF management may also find it useful to devise names for particular packages of its supershares—e.g., "bonds," "equity shares," "six per cent calls," etc.

As noted earlier, the economic utility of a PPF fund will be greatest if it comes close to holding the market portfolio, broadly interpreted.[11] A representative sample of the market may conceivably include as few as 100 instruments (stocks, corporate bonds, warrants, government securities) or as many as 1,500. In any case, each security held by the PPF should be centrally quoted and have a broad enough market to discourage manipulation (by supershareholders) as the maturity date approaches.[12] Similarly, both to keep management above suspicion of manipulation and to provide full-term investors with a clear-cut basis for choosing a full-term portfolio, the market portfolio held should remain fixed for each period. (It can and should, of course, be modified on the basis of changes in the market between periods.) The asset value of the PPF at the end of the period would consist of the closing market values of the original instruments, plus dividends and the market value of instruments (or cash) received in exchange in the case of mergers and from stock splits and stock dividends, with all cash receipts invested in a preannounced manner.

Floating Supershares

The most challenging managerial aspect of the PPF is the floating of new supershares. Let me begin by describing three possible approaches.

I. One approach would be an ordinary underwriting, in which a syndicate guarantees to raise, just prior to the issue date, a fixed sum for the PPF by selling all of its supershares at predetermined prices. This method can be expected to be fairly costly, although the underwriting risks (the first time around) can be kept to a minimum by gauging the size of the fund on the basis of tentative orders solicited by circulation of an advance price list.

II. Another route would be a variant of that used by no-load mutual funds, plus a bit of publicity. The prospective PPF would set its own supershare prices (some prior sampling wouldn't hurt) and would accept orders on the following prorated basis: Let the total number of "x per cent" shares ordered by investors before the deadline (just prior to the issue date) be $D(x)$. Find the minimum of the ratios $D(x)/(1+0.01x)$ over all applicable "x" and set it equal to "A." "A" now represents the initial asset size of the PPF for which a sufficient number of each kind of supershare has been sold. $D(x)-A(1+0.01x)$ then gives the number of excess "x per cent" shares ordered for that initial fund size; excess demands would be prorated, with each investor receiving proportion $A(1+0.01x)/D(x)$ of his "x per cent" share order, plus a refund for the amount of overpayment. For example, if the asset size "A" turned out to be $10 million, and 12,500,000 "15 per cent" shares had been ordered, each investor would be allotted 92 per cent of his "15 per cent" order, resulting in the issuance of 11,500,000 "15 per cent" shares—the correct amount for a fund of that initial size. (In principle, of course, it would be possible for management to price the supershares correctly so that no excess demand would result.) This approach is clearly quite conservative and management may well wish to accept a bit of risk by choosing a somewhat higher asset level "A."

III. A third approach would be for the PPF to issue only ordinary, but decomposable, mutual fund shares—that is, to issue supershares only in mutual fund share packages (e.g., a package composed, per $100 asset value, of 50 "–50 per cent" shares, 51 "–49 per cent" shares, ..., 100 "zero per cent" shares, ..., 160 "60 per cent" shares). Investors would then be left to modify their portfolios, if desired, by trading on their own in the secondary market, thereby establishing initial prices. At the maturity date, the supershare that becomes payable would be redeemable in cash and/or a new mutual fund share package spanning the next period. And so on.

The preceding examples are by no means exhaustive, of course. Each set of supershares could also be launched by simultaneous bidding, along the lines of floating Treasury bills or in ways similar to those by which new issues are sold in France.[13]

However floated when first sold, there is every reason to make the supershare payable in cash at maturity. While some holders undoubtedly will want

cash, in full or in part, longer-term investors will likely wish to reinvest all their proceeds in the next set of supershares offered by the PPF and some may choose to increase their position; in addition new investors will enter. The resulting between-periods net cash inflow may thus be either positive (resulting in a larger next-period PPF) or negative (resulting in a smaller next-period PPF). While a large net outflow seems rather unlikely, the expiring supershare could, of course, be made payable in the PPF's assets or in mutual fund shares (recall Approach III).

While the PPF could, at least in principle, always stand ready to increase or decrease its holdings in its chosen market portfolio (i.e., be fully open-ended), the most natural mode of operation is probably to do so between periods. This is also the natural point in time for management to modify the composition of its market portfolio on the basis of changes in the market, as issues come and go and as companies expire and grow.

What Size Transaction Costs?

Since the PPF is an entirely new concept, there is clearly no way to make an accurate prediction of the transaction costs that the investor can expect to face with supershares. However, to the extent that transaction costs represent compensation for services rendered, we can examine what lies behind them.

Consider the full-term investor who buys supershares when first offered and holds them to maturity, hence deals only with the PPF. Under Approach I (the underwriting approach) his transaction costs may well be substantial. But under Approaches II and III the PPF management assumes essentially no risk in connection with the floating of shares. Any excess over the closing prices preceding the issue date that the PPF has to pay to acquire its assets portfolio, however, represents a genuine element of risk exposure (this excess may, of course, turn out to be negative). This risk can be held down by various means: Any regular security desired by the PPF would presumably be acceptable as payment for supershares; the third market would probably also be helpful in executing purchases at or near the applicable closing prices. Actually, it is doubtful that even a large fund would exert much pressure on prices, even if it made all its purchases in the open market: A $50 million PPF with 500 instruments in its portfolio would need to acquire only a few dozen lots of each. Thus under Approaches II and III there is very little in the way of risk-bearing and very little in the way of administrative services (recall that the fund is unmanaged) for which management must be compensated. Under reasonably competitive conditions, then, and if the pricing is such that the excess demand for supershares in Approach II is low (requiring few corrective adjustments by investors in the secondary market), full-term investors might well face relatively low transaction costs. The same would be true, under Approach III, for investors who wish supershare holdings close to that of the mutual fund arrangement; those who do not would face more extensive, and certainly more costly, secondary market corrective transactions.

In the secondary market, there are no compelling reasons to believe that the level of supershare commissions would not be acceptable to investors, since they need only cover the costs of executing simple trades between investors in long positions: No option writers must be found (the PPF, in effect, has already written the options); there is no credit approval or naked writers' or short sellers' collateral to worry about, no margin positions to monitor, no margin calls to make. Since the net supply of supershares would be in the millions (as opposed to zero for regular options), a reasonably broad secondary market should develop.

Some Additional Questions

It is unclear whether it would be best to have many small funds, a few large ones, or one very large fund. Small funds would probably be easier to float and would insure competition, but they would also entail substantial duplication of effort. One could argue that, given a reasonable consensus on the contents of the market portfolio, one large fund is all that is really needed and is certainly feasible in countries with a well developed brokerage industry; however, the lack of direct competition would certainly be a drawback to this approach.

The PPF concept is, of course, dependent on the existence of a broad market in the underlying regular financial instruments (since it is the market values of these instruments that determine which supershare pays off). Thus the combined holdings of all PPF's in a given financial instrument cannot be too large a fraction of the outstanding supply of that security.

As the maturity date of a particular battery of supershares approaches, the prices of some supershares will increase while the prices of most will tend toward zero. As a result, we can expect trading in the secondary market in most supershares to cease before expiration. Conceivably, if two adjacent supershares appear roughly equally likely to pay off, their prices may be close to 50 cents right up to the moment of expiration even though one must become worthless and one will be worth close to one dollar at closing time. Call this gambling, if you will, but it would be gambling on by far the best terms available anywhere.

With respect to taxes, full-term investors who

continually reinvest their proceeds in the next set of supershares will likely be subject to capital gains tax only when they eventually sell out. With minor exceptions, this is the case for investors who hold on to their mutual fund shares now. The investor who initially buys a mutual fund package of supershares and continually exchanges it for a new one as it expires is in precisely that position. Why should he be treated differently?[14]

This paper has focused on a market-portfolio-based PPF because of the clear-cut economic benefits associated with such a fund; but issuance of supershares with a specialized real-asset base could also be profitable. These would be solely tied to such resources as energy, minerals, agriculture, or new companies. Similarly, if the general PPF does not issue supershares with sufficient density, there is clearly room for "satellite" PPF's—funds that hold a subset of the main PPF's supershares, issuing against each holding a richer set of supershares.[15] And supershare funds based on nominal, rather than deflated, returns are clearly just as easily implemented. An informed market must, of course, be the ultimate arbiter of the extent to which supershare funds are needed.

Finally, the creation of supershares via a simple financial intermediation process of the PPF type may discourage the proliferation of conventional instruments, since much that complex portfolios of regular instruments are able to achieve (such as hedging) is more easily achieved using supershares.

To sum up, the PPF concept offers a novel, simple, apparently feasible and above all flexible means for smaller investors especially to own the kind of slice of their nation's real assets that they perhaps always wanted to have—but were afraid to ask for. ■

Footnotes

1. For further details, see Nils Hakansson, "Efficient Paths Toward Efficient Capital Markets in Large and Small Countries" (Finance Working Paper No. 25-1, Institute of Business and Economic Research, University of California, Berkeley, December 1975); forthcoming in *Financial Decision Making Under Uncertainty,* Haim Levy and Marshall Sarnat, eds. (Academic Press).
2. Kenneth Arrow, "The Role of Securities in the Optimal Allocation of Risk-Bearing," *Review of Economic Studies* (April 1964).
3. For an indication of the role of the market return in modern investment analysis, see William Sharpe, *Portfolio Theory and Capital Markets* (New York: McGraw-Hill, 1970); James Lorie and Mary Hamilton, *The Stock Market: Theories and Evidence* (Homewood, Ill.: Richard D. Irwin, 1973); Richard Crowell, "Five Applications of Beta," *Financial Analysts Journal* (July/August 1973).
4. See Hakansson, "Efficient Paths," p. 48.
5. Of course, 10 million shares of each kind could have been issued, in which case the "–49 per cent" shares would be entitled to 51 cents per share (or nothing).
6. Alternatively, the PPF may wish to pay exactly one dollar, with the difference either reducing or increasing the management fee.
7. Since the change in the CPI is not announced until the middle of the month, the December 1, 1975-November 30, 1976, change in the CPI might be chosen as a proxy. This presents no problem as long as everyone knows the rules.
8. These numbers reflect the 1974 change in the Standard and Poor's 500 industrial stocks (including dividends) and the rate of inflation in that same year, as measured by the CPI.
9. There is nothing to preclude the real rate of interest from being negative, of course.
10. At the present time, a $5,000 short position requires a margin of $2,500 (50 per cent). If the investor put his remaining $7,500 in a 2.5 per cent (real interest) account, he could, if the asset in which he goes short goes down 25 per cent (in real terms), cover his position with $3,750, which would leave him with $11,437.50 (5,000–3,750 + 2,500 + 7,687.50). But with $10,000—in fact, $9,893 (see Table IV)—he could have bought 11,627 "–25 per cent" shares, plus a sufficient number of other shares to put him ahead by approximately $189.50 (in turn, approximately 2.5 per cent of 5,000 + 2,500) in each contingency.
11. See Hakansson, "Efficient Paths," p. 48.
12. The present lack of a centralized quotation system for corporate bonds in the United States may inhibit holdings in such securities.
13. See Jack McDonald and Bertrand Jacquillat, "Pricing of Initial Equity Issues: The French Sealed-Bid Auction," *Journal of Business* (January 1974).
14. It is also unclear whether the PPF concept is consistent with the Investment Companies Act of 1940. Implementation should be preceded by an administrative ruling by the Securities and Exchange Commission (or a clarification of or a change in the law). The purpose of this paper, of course, is to bring the PPF concept to the attention of the financial community so that its economic merits may be considered; any legal considerations are clearly secondary at this point.
15. For example, a satellite fund owning 1,050,000 of the "five per cent" shares issued by the PPF in our illustration might, against this holding, issue 1,046,000 "4.6 per cent" supershares, 1,047,000 "4.7 per cent" supershares, . . . , 1,054,000 "5.4 per cent" supershares, etc.