

The Economics of Cash Index Alternatives

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INTRODUCTION

Demands for holding and trading risk via broad market portfolios grew tremendously over the last twenty years. To meet these demands at low cost, several holding instruments and trading methods were created. These include index funds, stock index futures, stock index options, program trading, and portfolio insurance.

Several factors caused and will sustain the interest in index products: lower transaction costs which are a result of the deregulation of trading commissions, advances in information processing technologies, and the successful introduction of index futures and options that enables market risk to be more economically traded by speculators and by hedgers; the emergence of widely accepted and disseminated empirical results in favor of the efficient market hypothesis that convinces many investors to pursue passive rather than discretionary portfolio strategies; greater emphasis on fiduciary responsibility, partly motivated by ERISA, that makes passive index strategies attractive to pension fund managers; the growth of private pension funds and insurance funds that places more money under professional institutional management subject to fiduciary responsibility; and the increased use of broad market indices as benchmarks for portfolio evaluation and for portfolio manager compensation contracts that causes risk averse managers to seek more passive strategies.

Practitioners and regulators are not considering new index instruments and trading methods.¹ Practitioners are interested in lowering trading costs for the cash index portfolio. Regulators are concerned that excess volatility may be caused by derivative instrument trading and by program trading especially when associated with portfolio insurance strategies, index arbitrage, and contract expiration dates.

The comments and opinions contained in this article are those of the author only. In particular, the views here expressed do not necessarily reflect those of the U.S. Securities and Exchange Commission, nor those of the author's colleagues on its staff.

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¹See Katzenbach (1987) and SEC Division of Market Regulation (1988).

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This article considers the economics of cash index alternatives. Six alternative instruments are discussed: private index portfolios, open-end index mutual funds, closed-end mutual index funds, warehouse receipts,² stock index futures, and index participations (IPs).³ Program trading and package trading are also examined.⁴

There are two parts to the analysis. Section 1 considers factors that will affect investor acceptance of a cash index alternative. The results suggest that warehouse receipts and securitized open-end index funds (funds that can be continuously traded in secondary markets) will be the most successful new instruments. They will provide good index risk replication at low cost in a liquid form. Section 2 considers how markets would be affected by widespread use of these new instruments. A decrease in transaction-induced volatility may be the most important social benefit.

SECTION I

TRADER ACCEPTANCE

Factors that will determine acceptance of a new cash index alternative can be divided into concerns about costs and concerns about utility. The cost considerations include instrument creation costs, holding costs, and trade costs. Each cost analysis assumes that all services are provided in competitive markets so that the costs users pay are determined by physical considerations only and not also by market power. The utility considerations include risk replication efficiency, tax treatment, index composition, certain options and rights associated with stock ownership, and regulatory oversight.

INSTRUMENT CREATION COSTS

Instrument creation costs accrue when the net supply of an instrument changes. Open-end funds accrue these costs when deposit and redemption orders do not net out so that the fund must augment or liquidate its portfolio. Closed-end funds accrue them when the fund is created, augmented, or liquidated. Warehouses accrue them when portfolios are deposited or redeemed at the warehouse. Futures and IPs accrue them when open interest changes.

Registration costs include costs of accounting and certain costs of organization. Closed-end index funds incur the largest registration costs. New offerings are expensive because each must be registered with the SEC and underwritten. Liquidations are expensive because they often require hostile tender offers.

²Warehouse receipts would be receipts for a prespecified basket of stocks left on deposit with a trust company (the warehouse). Investors would create or redeem receipts by tendering or receiving the basket of stocks. Receipt holders would have the right to receive the dividends paid on the stocks, less a storage fee. A warehouse, in effect, would be an open-end index fund for which deposit and redemption transactions are conducted only in-kind. Receipts would be traded like stocks.

³An index participation is the generic name for a perpetual, zero net supply instrument that entitles long-holders to receive quarterly from short-holders dividends equal in amount to those paid to an underlying index portfolio (usually the S&P 500 index or an index designed to mimic the Dow Jones Industrial Average). Long-holders can cash-out at a price equal to the value of the index portfolio once a quarter, or at a discount of one-half percent of the index value on a daily basis. The obligation to do the cash-out is assigned to a short. Otherwise traders exit by offsetting their positions in the market. All settlements are in cash. The instrument trades under option trading rules subject to SEC regulation and Regulation T margins.

IPs were first proposed by the Philadelphia Stock Exchange. They are now traded there and at the American Stock Exchange. The AMEX instrument differs slightly in its cash-out provisions.

⁴A program trade is a set of related trades in many securities, each of which is separately executed. A package trade is a single trade of a prespecified set of securities. Stoll (1988) presents arguments and procedures for package trading. The NYSE currently has a proposal before the SEC for package trading in the S&P 500.

Registration costs for warehouse receipts are primarily the costs of transferring securities into and out of a warehouse. Since security transfers would be standardized and by book entry, these costs should be low once the warehouse and appropriate automated systems are established.

Registration costs for open-end index funds, IPs, and futures, are low. They are the costs of handling cash flows (deposits and redemptions for the funds, sales proceeds and margins for the IPs, and margins for the futures) and of keeping individual accounts current and accurate.

Stock transaction costs accrue when instrument creation requires that an index portfolio be assembled or liquidated. Instrument creation is necessary after each new offering or liquidation of a closed-end fund, every augmentation or liquidation of a private index portfolio, and whenever deposits do not equal redemptions for open-end funds. Transaction costs will be incurred in each of the underlying index stocks if the portfolio cannot be acquired or sold as a package.

Open-end mutual funds lower stock transaction costs in the short run by satisfying some deposit and redemption orders from a cash buffer. If net order imbalances are negatively serially correlated, some imbalances cross over time so that transitory changes in the size of the fund can be made without trading the portfolio. The use of a cash buffer, however, reduces replication efficiency. Funds that attempt to closely replicate index risk will have high stock transaction costs because all stocks must be traded quickly.

Warehouse receipt creation and redemption will not always require market transactions in the individual stocks. None is required if the creator already owns the index portfolio being tendered or if the redeemer does not intend to liquidate the portfolio. (This generally would be the case if the depositor or redeemer is an index fund.) If warehouse receipts are created or redeemed by arbitrageurs, costs would be incurred when the component stocks in the index portfolio are purchased or sold. The arbitrage spread compensates for costs incurred when creating or redeeming receipts.

Stock transaction costs of instrument creation for the futures and IPs depend on whether the demands for a net change in open interest are satisfied by arbitrageurs. If so, they will trade in the individual stocks to construct or liquidate their arbitrage portfolios. The costs of these trades will be reflected in the basis and they will be compensated for this service when the basis closes. If the demands are satisfied by hedgers or speculators, no stocks need be traded.

Derivative arbitrageurs will generally incur smaller stock transaction costs than will other index portfolio assemblers/liquidators since they do not have to construct their hedge portfolio using the exact cash index portfolio. They can trade in fewer stocks than are in the index and can select those stocks based in part on which stocks they believe are cheapest to trade. Arbitrage bounds for the derivative instrument arbitrageurs may therefore be tighter than for the warehouse receipt arbitrage.⁵

HOLDING COSTS

Holding costs are incurred on a continuing basis to maintain the supply of the instrument. These may include costs of accounting for an index portfolio, of updating an in-

⁵This assumes that the derivative arbitrageurs will not unwind their positions until the arbitrage is profitable in the other direction. If instead, they unwind their positions at expiration instead of rolling over, they will incur stock transaction costs twice. Since they must be compensated also for the costs of closing their position, the initial basis would be wider. Brennan and Schwartz (1989) provide a more complete analysis of optional arbitrage strategies when arbitrageurs face transaction costs.

dex portfolio to reflect changes in the index composition, of margin account maintenance, of dividend payment, and of rolling over expiring futures contracts.

Private, open-end, and closed-end index funds pay holding costs through management fees and reduction of net asset value due to transaction costs incurred when rebalancing their portfolios.⁶ These costs are similar for each instrument since each represents direct ownership in the same underlying portfolio. Private index portfolios have a small cost advantage over public funds because they do not need to keep track of individual accounts and pay dividends to many holders. Their holding costs also may be lower if they have greater freedom to time their trades when rebalancing in response to changes in index composition and when reinvesting dividend payments than do the public funds. The latter may place greater emphasis on replication.

The costs of maintaining warehouse receipts and paying out dividends are collected through storage fees. If the warehouse is responsible for rebalancing, stock transaction costs will reduce the amount of dividends that are ultimately passed through. Otherwise, rebalancing costs are borne by receipt holders who must make their receipts current by tendering added securities and redeeming dropped securities. The additional costs imposed on each receipt holder and the additional transactions with the warehouse probably will make individual rebalancing more expensive than collective rebalancing by the warehouse.

Holding costs for futures are collected through depreciation of the basis. For IPs, they are paid through an initial purchase premium. Both compensate arbitragers for the costs of holding, managing, and maintaining their hedged positions. These costs are lower than those incurred by index funds and warehouses because derivative hedgers do not need to trade when index composition changes. However, they may be higher if the hedged position is subject to large and expensive margins.⁷ Holding costs for futures should be lower than those for IPs because the latter are subject to higher (Regulation T) margins.⁸

Futures incur additional holding costs when positions must be periodically rolled over. This cost, which depends on brokerage commissions and the bid/ask spread, is low. For long holders, IPs are perpetual instruments and therefore do not need to be rolled over. Forced cash-outs, however, make them randomly lived instruments for short holders.

TRADING COSTS

The most expensive index trading method is program trading, which requires as many as 500 separate stock trades. Each incurs brokerage commissions and trading losses due to bid/ask spreads and market impacts. A short program sell is especially expensive because of the many securities that must be borrowed. An additional unattractive feature of program trading is execution uncertainty. Since programs are not instantaneously exe-

⁶Since index funds usually try to replicate returns to a value-weighted (S&P 500) or price-weighted (MMI, DJIA) index, their portfolios do not need to be rebalanced in response to price changes. Rebalancing is only required when stocks are added to or deleted from the index, the underlying firms issue or retire their equity, or dividends are reinvested. The number and size of these transactions can be minimized if management is willing to trade-off replication efficiency.

⁷Margin costs are reduced by the interest that can be earned by posting margins (and short sales proceeds) in treasury bills. Margins are still costly, however, because traders are unable to borrow at treasury rates.

⁸Regulation T requires initial margins of 50 percent on a purchase or short sale of security. The total collateral for a short sale is the sum of proceeds plus the margin, or 150 percent. A proposal is pending before the SEC that would permit shorts to post margin using an escrow receipt for the index portfolio which would substantially lower holding costs.

cuted, some stock trades may occur at unanticipated prices, especially when prices are changing quickly.

The package trade, a single trade of a prespecified basket of securities, is cheaper than program trading. Basket diversification lowers the bid/ask spread by eliminating firm-specific risk and the associated adverse selection spread component in each stock.⁹ Standardization provides economies of scale in clearing and settlement. Bundling eliminates execution uncertainty.

Since every stock in the basket must be delivered and settled with the attendant accounting costs, package trading costs will be higher than for the alternatives that only have to settle and clear a single index instrument trade. These additional costs of package trading should not be large if settlement is by book entry only and handled by automated systems.¹⁰

Open-end index funds have low trading costs because redemptions and deposits do not require intermediation by clearing and settlement agents (aside from that provided by the fund and the banking system), and because redemption and deposit orders do not incur bid/ask spreads and market impacts. These advantages are offset by execution uncertainty. Open-end funds cannot allow investors to know the exact price at which deposits and redemptions will take place for cash settlement at net asset value before they decide to trade. Otherwise, investors who can better determine net asset value than can the fund will time their trades to profit at the expense of the other fund holders. This problem with cash settlement can be serious if some of the prices from which net asset value is computed do not reflect current values. For example, if values rise quickly at day-end and not all stocks trade, net asset value would be underestimated by the fund and informed traders would purchase it at the computed net asset value.¹¹ The cash settlement problem effectively prevents open-end index funds from allowing continuous deposits and redemptions. This restriction decreases liquidity and should be considered a trading cost. It can be eliminated by allowing continuous secondary trading of open-end index fund shares.^{12,13}

The markets for all instruments that can be traded in a single transaction should be characterized by similar bid/ask spreads and market impacts in response to order imbalances because each instrument embodies essentially the same index risks. Although

⁹Market-makers widen the bid/ask spread beyond what would be necessary to compensate them only for the value of their time and other resources spent making markets. The additional widening of the spread (the adverse selection spread component) transfers from uninformed traders wealth that the market-makers lose to well-informed traders. Since index trading does not expose market-makers to firm-specific risk, there should be no adverse selection spread component due to informed trade in firm-specific risk.

¹⁰Additional costs will also be incurred if the package must be bundled before and/or unbundled after the trade. These costs are instrument creation costs and would be similar to those of assembling a bundle for deposit to a warehouse.

¹¹This problem of computing the value of a portfolio containing thinly traded stocks is considered in Harris (1989).

¹²Section 22(d) of the Investment Company Act of 1940 currently prevents dealers from selling open-end mutual funds at prices different than net asset value. This effectively keeps a secondary market in open-end fund shares from forming. An exemption, however, can be crafted by the SEC.

If regulations are not changed, it may be possible to place the mutual fund shares in a trust and then trade the trust units. The result is similar to a warehouse receipt.

¹³Arbitrage of open-end index fund shares would be more expensive than the warehouse receipt arbitrage. If the share trades at a discount to the index, arbitrageurs will buy the share and sell stocks. After the discount closes, they will redeem the share for cash (forcing the fund to sell stocks). At the same time, they will repurchase stocks to cover their short positions. Their repurchased stocks are in effect the same ones that the fund sold to cover the redemption request. The warehouse receipt arbitrage is cheaper because warehouse deposits and redemptions are in-kind so that the underlying stocks would only be transacted once, if at all.

there may be some minor differences within arbitrage bounds due to different trading volumes and market structures, there should be few differences across instruments if volume and market structure are held constant.

Trading costs differ from instrument creation costs that sometimes also are incurred when a trade is made. The latter are incurred only if a trade changes the net supply of the instrument. Since the probability of this occurrence differs for the various instruments, it is necessary to consider when trades require instrument creation to more completely understand trading costs.

Trades generate instrument creation costs for open-end index funds when deposits and redemptions do not net to zero. Funds reduce these costs by pooling deposits and redemptions for execution only once a day and by maintaining cash reserves to accommodate order flows that might be out of balance on any given day, but which may come into balance over several days. For warehouse receipts, futures, and IPs, instrument creation costs accrue when arbitrageurs buy or sell a hedge portfolio to cover positions established to satisfy order flow imbalances. They are compensated for these costs by prices that bounce between the arbitrage bounds.

For a given order flow, new instrument creation will be required less often for the index securities that can be traded in continuous secondary markets than for the open-end mutual funds that cannot because secondary market-makers in index securities use their inventories to satisfy transitory order flow imbalances. If the imbalances truly are transitory, the inventories will be restored so that the position will not need to be offset by transacting in the underlying securities. Market-maker inventories thus play the same role as the cash buffer stock maintained by the open-end fund.

UTILITY CONSIDERATIONS-REPLICATION EFFICIENCY

An index instrument replicates index risk efficiently if returns to holding the instrument are the same as returns to the index. Close replication is attractive to investors for whom fund manager performance audits are costly.

Replication efficiency for private index portfolios is limited only by the costs of portfolio rebalancing when index composition changes and by share indivisibilities that require integer stock positions to be held when fractional positions are desired.

Since warehouse receipts are in effect claim checks on a private index fund, they replicate risk as well as private index funds. Returns may differ slightly, however, because order flow imbalances will cause receipt prices to vary within arbitrage bounds.

Open-end index fund replication efficiency is limited by rebalancing problems, share indivisibilities, and two other problems. The cash settlement problem, if left unsolved, causes the fund to lose assets to better informed traders and hence underperform its underlying index. Second, the cash (*T*-bills) that an open-end fund holds to accommodate order-flow imbalances causes returns to its portfolio to differ from returns to its underlying index.

Three sources of uncertainty cause returns to stock index futures to differ from the underlying index returns. Dividend uncertainty is most important. Since dividends on the underlying stocks are not paid to the holders of futures contracts, futures tend to sell at a discount relative to the cash index. (Another determinant of the basis, the time value of money, often overwhelms the dividend discount and causes the futures to sell at a premium to the index.) The discount, the expected dividend component of the basis, is uncertain because dividend payments through the expiration of the contract are uncertain. Returns to the futures differ from the underlying index because realized dividends generally differ from expected dividends. Second, uncertain reinvestment interest rates also

make the basis uncertain because cash flows due to the adjustment of variational margins must be reinvested. The third uncertainty is due to order imbalances for the contract that cause variation in the basis within the arbitrage bounds.

Although the total variation in the basis due to these uncertainties is small relative to variation in the underlying index, some evidence suggests that investors dislike the additional risk. Open interest in the stock index futures markets concentrates in the nearest delivery contract and only rolls over into the next contract near expiration. This suggests that investors are interested in current index risk and not future risk. If the futures were being used to speculate, invest, or hedge in *future* S&P 500 risk, more open interest would be observed in distant delivery contracts, such as is observed at planting time for the harvest contract in the grain markets. The difference in risk between the near and far contracts is due primarily due to dividend uncertainty which is greatest for the far contracts. This suggests that practitioners prefer instruments that mimic as nearly as possible only the risk of the underlying index portfolio.¹⁴

Risk replication for the IPs differs from that of the futures in two respects. First, since shorts pay dividends to the longs, IPs are priced cum dividend so that dividend uncertainty does not affect replication. Second, since IPs do not allow short-holders to demand a cash-out (the untraded CBOE IP does), the upper arbitrage bound for these instruments is poorly defined. If an IP sells at a premium to the index,¹⁵ arbitrageurs will sell it and buy the index, but they cannot force the basis to close by demanding a cash-out. The short-side arbitrage is, therefore, of indefinite, perhaps even infinite lift. If the arbitrage consumes any resources, the upper arbitrage bound will be high and replication efficiency of the instrument will be poor.

Risk replication for closed-end index funds is poor compared to the other cash index alternatives. Arbitrage between a closed-end mutual fund and its underlying cash portfolio is difficult because no redemption and deposit mechanisms exist to force the price to equal net asset value. As a result, closed-end mutual funds sell at discounts or premia to the index depending on the aggregate demand and the present value of expected fund costs and benefits.

TAXES

Tax considerations will make some index alternatives more attractive than others to tax-paying investors. Taxpayers will favor private portfolios over cash index securities because private portfolios preserve the option to defer capital gains on appreciated stocks until they are realized and to realize capital losses as they accrue.¹⁶ The option to defer

¹⁴An alternate explanation for the open interest behavior is that future risks can be hedged nearly as effectively with the near contract as with the far contract since both are closely correlated. If so, traders would prefer the most liquid contract, which would be the nearest contract. But if near and far contracts were perfectly correlated, they would have similar liquidity. This suggests that the imperfect correlation between near and far contracts is recognized by traders.

¹⁵The IP should sell at a premium to its underlying index since it will provide the long holder with the same dividends and capital appreciation that a perfect index fund would provide without the management fees that are associated with the index fund. It should also sell at a premium because an actual index fund loses value relative to the underlying index when it pays brokerage commissions and bid/ask spreads to trade stocks in response to a change in the composition of the underlying index. In perfectly functioning capital markets, the premium should equal the present value of the sum of the open-end index fund management fees and the cost of rebalancing the portfolio. For the Vanguard Index 500 Portfolio, these annual costs are currently about 0.22 percent and 0.05 percent, respectively. If the present value discounting factor is ten percent and these are expected to be constant forever, the premium should be equal to 2.9 percent. The premium should be substantially greater if maintenance of short arbitrage positions is expensive.

¹⁶Constantinides (1984) analyzes these tax-timing options.

capital gains also will make IPs more attractive than futures because the latter must mark to market at year-end for tax purposes. Open- and closed-end funds will be valued differently depending on how they are taxed and on how much dividend income and capital gains are undistributed. If profits from futures are taxed as a rate between the ordinary income and the capital gains rates, as they were when these rates were different, these instruments also would be valued differently by some investors.

Although tax considerations are of first order importance to some investors, they are of little importance to the large and growing numbers of tax exempt passive index investors. Some market segmentation may result to satisfy the different needs of tax-paying and tax-exempt investors.

INDEX COMPOSITION AND VOTING RIGHTS

Some investors, by law or by conscience, are unable to hold certain stocks in their portfolios. In some cases they cannot even transact these stocks. Examples include pension plans that are unable to hold stock in their parent company, and various institutions that are unwilling to hold stock in companies doing business in South Africa. Alternatives specific to their needs will develop (such as instruments defined over acceptable firms), or they will continue to hold private portfolios exclusive of the offending stocks.

The right to vote stock and the right to tender stock in response to offers are often valuable rights. Owners of private portfolios control these rights directly. In public funds, these rights are under the control of the investment manager. If these rights are valuable but that value is not captured by the public funds, investors will find private index portfolios and warehouses that preserve these rights to be more attractive.

REGULATORY OVERSIGHT

IPs may be more attractive than futures to certain investors because they are currently legally classified as securities and regulated by the Securities and Exchange Commission.¹⁷ Funds that cannot trade futures, either because they are not securities or because they are not regulated by the SEC, may be able to trade IPs. This could lead to wider acceptance of IPs. However, if the prohibition against trading futures is motivated by economic reasons unrelated to who regulates the instrument, these funds probably might also be prohibited from trading IPs.

SEC regulation of IPs also allows this instrument to be traded by small retail traders who meet options suitability standards. Since a round lot of S&P 500 IPs currently represents only 3200 dollars of index risk, many small investors may participate in the index market who otherwise would not.

SEC regulation also allows IPs to be traded in large block trades organized off the exchange floor. Large institutions, therefore, may prefer IPs over futures which currently can be traded only by open outcry auction.

SUMMARY OF SECTION I

The various factors that will likely affect trader acceptance of the cash index alternatives are summarized in Table I. Each alternative has attractive features and some associated problems.

¹⁷In a suit currently before the federal courts, the Chicago futures exchanges claim that the IP is a futures contract that should be regulated by the Commodity Futures Trading Commission.

Program trading allows complete flexibility over the set of stocks traded. This is important to traders who cannot or will not trade some stocks. Programs are expensive, however, because firm-specific spreads and market impacts are incurred for each security. These programs are also unattractive because they cannot be executed with complete price certainty.

Package trading lowers bid/ask spreads by eliminating market-maker concerns about firm-specific risk. Since a package trades in a single transaction, execution uncertainty is greatly reduced. Package trading does generate, however, settlement and clearing costs for each security in the package.

Private index funds are an attractive holding vehicle because they preserve tax options, voting rights, the option to tender to an offer and are tailored easily to specific needs. Unfortunately, private index funds are not easily traded.

Closed-end mutual funds are securities and therefore easily traded. They are costly to create, however, and they do not replicate index risk well because arbitrage mechanisms cannot eliminate variable discounts and premia.

Open-end mutual index funds replicate risk well and at moderate cost. Unfortunately, they lose assets if imbalances between deposits and redemptions are frequent or if traders can better estimate underlying net asset value than can the funds. Open-end mutual funds also cannot be traded continuously. Their liquidity could be increased if continuous secondary trading of fund shares were allowed.

Warehouse receipts would avoid the cash settlement problem faced by open-end mutual funds by requiring settlement in-kind. They would provide good risk replication and would be easily traded. Their deposit and redemption procedures, however, could be cumbersome and procedures to update the deposited assets to changes in index composition might be expensive.

Futures are currently the most liquid index instrument. Their risk replication is less than perfect, however, because dividend uncertainty makes the basis uncertain. Replication could be improved by requiring shorts to pay longs dividends on the underlying stocks.

The IPs are not subject to dividend uncertainty. They do not have to be rolled over frequently as do futures and they may be attractive to investors who prefer SEC oversight and block trading facilities. However, they are subject to high margins and they replicate risk poorly because they do not allow short-holders to demand a cash-out.

Based on these observations, it seems that warehouse receipts and securitized open-end mutual funds have the greatest chance of succeeding as new cash index alternatives. Since their main differences are in their settlement terms, a hybrid fund offering both in-kind settlement and cash settlement at a slight premium may be most successful. Such an instrument would be easily traded and would replicate risk well at low cost.

SECTION 2

MARKET EFFECTS

Widespread acceptance of a new index alternative will affect index market composition, market volatility, liquidity, and arbitrage. This section analyzes these effects assuming that a warehouse receipt, a securitized open-end mutual fund, or some hybrid of the two becomes widely accepted. The expected benefits of supershare trading are also briefly discussed.

It is important to note that acceptance of a new instrument depends on whether it is able to attract liquidity comparable to that now present in the futures markets. Black (1986) and Johnson and McConnell (1988) show that a new and theoretically superior instrument can fail if a closely correlated instrument already trades in a very liquid market.

Table I
TRADER ACCEPTANCE ISSUE SUMMARY FOR CASH INDEX ALTERNATIVES

Alternative	Characterization	Instrument Creation Costs				Replication Efficiency ^e	Miscellaneous
		Registration ^a	Stock Transaction ^b	Holding Costs ^c	Trading Costs ^d		
Program trades (Trading method)	Simultaneous trades of many stocks.	Low. A broker service. Must be repeated each transaction.	Portfolio assembly costs incurred on every transaction.	Not applicable.	Very high. Costs in each security, execution risk. Short sales can be expensive.	Not applicable.	
Package trades (Trading method)	A single trade of a prespecified set of stocks.	Low. Exchange provides organizational overhead.	Portfolio assembly costs incurred if bundle is broken.	Not applicable.	Medium. Clearing and settlement in each security. Short sales can be expensive.	Not applicable.	Potentially modifiable to allow designer portfolios.
Private index portfolio (Holding instrument)	Special case of an open-end mutual fund with only one holder.	Low. Broker or trust company provides as service.	Portfolio assembly costs incurred once.	Very low.	Very high if by program trade. Low if by package or receipt.	Excellent.	Preserves tax timing options, voting rights, other options.
Open-end mutual index funds (Holding and trading instrument)	Cash settlement of deposits and redemptions. Securitization possible.	Medium. Legal, reporting, correspondence expenses.	Portfolio assembly costs incurred if orders do not cross in long-run.	Low. Rebalancing can be relatively expensive. Accounting costs.	Medium. Execution uncertainty. Very low if securitized.	Very good. Some risk from execution uncertainty.	Could be securitized

Closed-end mutual index funds (Holding and trading instrument)	Traded as a listed security.	High. Offering underwritten. Legal, reporting expenses.	Portfolio assembly costs incurred once.	Low. Rebalancing can be relatively expensive.	Very low.	Poor. Discounts or premia vary because arbitrage is difficult.	Loss of tax timing options can affect valuation.
Warehouse receipts (Holding and trading instrument)	Securitized open-end index fund with settlements in-kind.	Medium. Similar to open-ended fund. Clearing expensive.	Portfolio assembly costs incurred once.	Very low if rebalancing need not be done quickly.	Very low.	Excellent.	May be designed to preserve stock voting rights.
Futures (Holding and trading instrument)	Zero net supply, zero investment derivative instrument.	None.	Low. Hedge portfolio can be assembled with flexibility.	Low. Rebalancing flexible. Margin may be costly.	Very low.	Medium. Dividend and reinvestment interest rate risks.	Could be changed to pass through dividends.
IPs (Holding and trading instrument)	Indefinite-lived, zero net supply, zero investment instrument.	None.	Low. Hedge portfolio can be assembled with flexibility.	Low. Rebalancing flexible. Margin costly. Roll-over sometimes needed.	Very low.	Medium. No dividend risk but short-side arbitrage is poor.	Small units may appeal to retail market. Potential block market.

^aRegistration instrument creation costs are costs due to accounting, security registration, and incorporation.

^bStock transaction instrument creation costs are costs incurred when instrument creation requires transactions in an index portfolio.

^cHolding costs are costs incurred to maintain an alternative cash index instrument.

^dTrading costs are costs directly related to the trading of the index alternative. When a transaction causes the supply of the instrument to change, the total transaction cost is the sum of the instrument creation cost and the trade cost.

^eReplication efficiency refers to the extent to which risk in an index alternative holding vehicle replicates risk in the underlying index.

INDEX MARKET COMPOSITION

If a new index alternative represents a better way of holding and/or trading index risk than is currently available, it will displace existing substitutes. Private index funds will be converted into the new instrument. Open interest and trading volume in futures will decline.

The conversion of private index portfolios will be limited by the value of tax timing options and by the demand for designer portfolios. Since much of the current index fund market is held by tax-exempt organizations, many of these funds eventually may be converted. A new instrument therefore has the potential to capture more than 150 billion dollars of index capital.

The decline of the futures market will be limited by the demand for cheap naked short positions. The futures market can provide these positions at lower cost than other alternatives for which expensive margins may apply to short positions. Short covered hedgers who currently use futures to time the market because they are more liquid than stocks will withdraw from the futures market as they convert their index portfolios to the new liquid instrument. Market timers who currently trade the synthetic index (long index futures held with bills) will withdraw from the futures market and purchase the new instrument when covered short hedgers convert their index portfolios.

A successful new instrument will attract also new funds to passive index investment. Funds that value liquid equity investments but which are legally unable to purchase the futures necessary to create synthetic stock will find the new instrument especially attractive. Retail investors will be attracted also to the new instrument if the value of the trading unit is small.

VOLATILITY AND LIQUIDITY

Widespread acceptance of a new index alternative will affect two separate components of volatility: fundamental volatility and transaction-induced volatility.

Fundamental volatility occurs when prices change to reflect new information about firm prospects. Since security prices are used to determine efficient capital allocations and to evaluate manager performance, prices are most useful when they fully reflect all current and past information about prospects. Low cost trading instruments allow prices to be more informative by increasing the profits of well informed traders. Resources spent on information acquisition increase and trades based on information with smaller expected impact become feasible. Any improvement in information aggregation efficiency due to the introduction of a new cash index alternative, however, will be slight and hard to observe since the futures market already provides a very low trading cost instrument.

Transaction-induced volatility is caused by the bid/ask spread and by uninformed order flow imbalances. It obscures the fundamental information in prices and increases the costs of trading for uninformed investors. Uninformed traders value liquidity, the ability to trade on demand at low cost because it allows them to plan future consumption and to respond to financial crises with greater flexibility and at lower cost. The more liquid equity markets are, the more money they will invest in them. This lowers the cost to firms of acquiring capital for investment and therefore benefits the economy.

To understand the effects that widespread acceptance of a new index alternative will have on transaction-induced volatility, the mechanisms by which liquidity is supplied to the market for small and large order imbalances must be considered. Small order imbalances are satisfied by inside market-makers, specialists, floor traders, and scalpers. They buy from impatient sellers and sell to impatient buyers when only one side of the

market is present. Inside market-makers are compensated for this service by the bid/ask spread that they hope to collect on average. In competitive markets with no information asymmetries, the spread will be the amount just necessary to compensate these market-makers for their time and resources spent in market-making activities. In practice, inside market-makers do not collect the full spread because they occasionally unknowingly trade with traders better informed than themselves. Well-informed traders who anticipate future value changes trade only on that side of the market that will yield a gain. Market-makers that trade with them lose when prices change against their position. To compensate for these losses, they quote and trade at a higher ask and a lower bid than would be expected considering only their direct costs. The widening of the spread, the adverse selection component of the spread, allows them to collect from uninformed traders what they lose to well-informed traders. It is large when the fraction of the order flow that is due to well informed traders is large.¹⁸

The adverse selection spread is a mechanism by which information in the order flow is impounded into prices. Inside market-makers, assuming that some liquidity demanders are better informed than themselves, raise price when confronted with buy orders and lower price when confronted with sell orders. If the orders are in fact based on new information, price will continue to change until it reflects fundamental value. If not, the price will differ from fundamental value. It will revert to fundamental value when informed traders respond to the profit opportunity.

This mechanism works well when satisfying small order imbalances but it can be overwhelmed by large imbalances, especially if they are generated by uninformed traders. Inside-market makers, being largely uninformed as to the fundamental value of the stocks in which they make markets, are reluctant to take large long or short positions. Large order imbalances must therefore be satisfied by better informed traders. These traders, called outside market-makers, are either well-informed traders (speculators) or intermediaries who can somehow certify that the order flow imbalance is due to uninformed traders (upstairs market-makers).

A new widely accepted cash index alternative will decrease the spread for a cash index market order. Currently, these orders are executed in each of the underlying stocks. When these orders are executed in a single index market instrument, the spreads will be smaller because there will be no adverse selection component due to firm-specific information asymmetries.¹⁹ The lower spread for a cash index order will decrease the costs of cash index trading and therefore increase the volume of trade in the cash index. The withdrawal of index-motivated orders for individual stocks will increase adverse selection spreads for the individual stocks because the fraction of informed orders in the remaining order flows will increase.

¹⁸Bagehot (1971) first described this spread component. See Copeland and Galai (1983), Glosten and Milgrom (1985), Easley and O'Hara (1987), Glosten (1987), and Glosten and Harris (1988) for theoretical development and empirical tests of the adverse selection spread theory.

¹⁹Orders for an individual stock that can be identified as part of an index order may face a smaller spread than other orders. Index orders can often be identified by their size, timing, and/or manner by which they are conveyed to the market. Trades in a program designed to efficiently replicate the S&P 500 usually are submitted in multiples of well recognized minimum sizes. Orders that are multiples of these sizes may therefore be index-motivated. Since index orders often are generated by arbitrage, some index orders may be recognized by examining the futures-stock basis. Finally, since program orders that come over the DOT system are identified as such, some program orders may be identified as index-motivated, especially when other clues are present.

Note, however, that if orders identified as index-motivated face smaller spreads, traders in firm-specific risk will disguise their orders so that they appear as index-motivated orders. This would make it more difficult to reliably identify index-motivated orders.

A central cash index market should be able to provide greater liquidity to uninformed cash index order imbalances than currently can be found in the markets for the many individual stocks. Market-makers in the individual stocks are reluctant to satisfy large uninformed cash index order imbalances without large price changes because they cannot perfectly distinguish these imbalances from order imbalances motivated by firm-specific information. Since market-makers in index risk do not face firm-specific risks, they can better recognize uninformed index order flows and profit by trading against them. Without a central market for cash index risk, however, it is difficult to aggregate the information necessary to characterize the index order flow and it is expensive to supply liquidity to that order flow (because trades must be executed using programs). A cash index market will centralize information about the cash index order flow and enable market-makers to collect a spread when providing liquidity in the index. Index market-making therefore will be less expensive and more will be supplied. The result will be lower transaction-induced volatility as market-makers satisfy larger order imbalances out of their inventories and public orders cross without intervention in 500 separate markets.

Cash index liquidity also would increase if private index portfolios are converted into the new instrument. Since the converted funds would be much cheaper to trade, they could be used to provide liquidity to the market on short notice. Interested fund managers, especially market timers unable to trade futures, would then be able to more profitably speculate against price changes that they believe are due to uninformed order flow imbalances.

ARBITRAGE

The introduction of new cash index alternatives will not eliminate arbitrage. Arbitrage occurs whenever similar risks are traded using different instruments. Arbitrage relations will exist among the futures contract, the cash alternatives, and the cash index portfolio. The price relation between futures and the cash index securities will be very tight because transaction costs and execution uncertainty are both low.

Arbitrage involving individual stocks will decline. When index-motivated orders are no longer sent to market-makers in the individual stocks, the remaining order flow will be more informative about firm-specific risks. Adverse selection spreads will widen and stock prices will become more sensitive to the order flow. An arbitrage program trade of a given size will therefore have a greater impact on individual stock prices and thus will eliminate arbitrage opportunities faster.

Stoll and Whaley (1987) show that some transitory index volatility is currently caused by trading activity on index futures and options expiration dates. Much of this activity is caused by arbitrageurs trying to unwind hedged positions. If the introduction of a cash index alternative increases cash index liquidity, this volatility would be attenuated. It also would make it easier to permit physical delivery on the futures which could further reduce expiration day volatility.²⁰

CONCLUSIONS

This article compares index instruments presently used with proposed instruments. It considers which are most likely to succeed and what their impact on the marketplace will be. The analyses suggest that securitized open-end index funds and warehouse receipts will be most successful. Since a warehouse is in effect an open-end index fund

²⁰Physical settlement of stock futures is now prohibited by 7 U.S.C. 1 § 2a (ii)(I).

with deposit and redemption settlement in-kind, some hybrid of the two instruments may be most successful.

Such an instrument, if successful, would be a close substitute for the index futures contract. Volume and open interest in the futures would therefore decline. If a cash index alternative becomes widely accepted, cash market volatility due to index order imbalances should decrease. The improvement in liquidity will result from decreases in the costs of making-market in the cash index.

Separation of the cash index market from the individual security markets should increase economic efficiency in both markets. Index-motivated demands for liquidity are different from firm-specific demands for liquidity. No obvious reason suggests that they are best satisfied jointly rather than separately. The adverse selection spread in each stock currently causes cash index traders to subsidize firm-specific traders. If the demands for index trade and for firm-specific trade are at all elastic, joint supply causes too little of the former and too much of the latter to be demanded.

Separation of the two markets will probably increase the adverse selection spread component in the individual markets. This would make the security markets more sensitive to order flow. This should decrease the total volume of arbitrage involving stocks because an arbitrage program of a given size would have a greater effect on prices.

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