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Dynamic Asset Allocation and the Informational Efficiency of Markets

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ABSTRACT

Markets have an allocational role; even in the absence of news about payoffs, prices change to facilitate trade and allocate resources to their best use. Allocational price changes create noise in the signal extraction process, and markets where such trading is important are markets in which we may expect to find a failure of informational efficiency. An important source of allocational trading is the use of dynamic trading strategies caused by the *incomplete equitization of risks*. Incomplete equitization causes trade. Trade implies the inefficiency of passive strategies, thus requiring investors to determine whether price changes are informational or allocational.

I WILL TRY TO GIVE a slightly new perspective on three related questions.

1. When are markets likely to be informationally efficient?
2. How does a decentralized economy allocate risk and investment resources when information is dispersed?
3. Are there types of information which individuals must possess to allocate risk, or is there a passive approach based upon prices alone that provides all the relevant information?

I have defined informational efficiency as a situation where prices aggregate and convey all current information about future asset returns in the sense of being a sufficient statistic.[1] This view is most elegantly expressed by Hayek:

> *We must look at the price system as a ... mechanism for communicating information if we want to understand its real function ... The most significant fact about this system is the economy of knowledge with which it operates, or how little the individual participant needs to know in order to be able to take the right action ... by a kind of symbol, only the most essential information is passed on ...*[2]

I have argued that markets cannot be perfectly efficient when information is costly, for if they were, then no one would be able to earn a return from

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[1] See Chapter 3 in Grossman (1989).

[2] Hayek (1945), pp. 526–527.

devoting resources to information collection.[3] I first used the concept of noise to describe the extent to which prices move for stochastic reasons unrelated to payoffs, causing noise in the signal extraction process of uninformed investors.[4] This "noise" allows informed investors to earn a return from their information collection and processing. Others have described the efficiency of markets by the extent to which there are noise *traders*.[5] This essentially derogatory view is not a helpful description of the noninformational role of markets. In my view, the noise in the signal extraction process is due to the allocational role of markets.

Markets have an allocational role; an increase in investment demand in one sector of the world will cause prices to change in such a way as to increase the allocation of risky capital to that sector. The allocational price change facilitates a capital flow; the price change is not necessarily reflecting any new information about asset payoffs. Such price changes create noise in the signal extraction process, and markets where allocational trading is important are markets in which we may expect to find a failure of informational efficiency. Herein, I want to give a new view of the determinants of this allocational role. In particular, I believe the allocational role of securities is a consequence of something that I describe as the *incomplete equitization of risks*, which is the failure to sell off claims to future income streams, and the failure to purchase claims to future consumption streams. Incomplete equitization causes trade. Trade implies the inefficiency of passive strategies. The inefficiency of passive strategies requires investors to make a judgment about whether price moves are informational or allocational. The theme of this article is that markets will not be informationally efficient as long as passive strategies are inadequate. Passive strategies are inadequate as long as there is incomplete equitization.

I. Informational Role of Prices

The rational expectations equilibrium (REE) informational view of securities markets explains how people use the information contained in prices to manage their portfolios.[6] The theory begins with the assumption that information is dispersed throughout the economy. The theory corrects an inconsistency in ordinary, noninformational demand theory, where it is assumed that an individual maximizes his expected utility by choosing a securities demand based upon his private information; prices enter the optimization problem

[3] See Grossman (1977a) and Grossman and Stiglitz (1980).

[4] See Grossman (1977b).

[5] See Black (1986), De Long *et al.* (1990a, 1990b), and Kyle (1985).

[6] See Chapters 1 and 2 of Grossman (1989) for a review and survey of rational expectations theory, as that theory applies to financial markets.

only by affecting the costs of securities, but the information which other individuals have incorporated in the market clearing price is ignored.[7]

The inconsistency arises because when each person forms his demand, he asks how much of a security he would want at an *arbitrary* price, p. The informational approach corrects this inconsistency by requiring that each person ask: how much would I want at a price p, if that represents the best price which is available in the market? That is, how much of the security do I really want at the price p, if that is the price that other partially informed investors are willing to trade with me? The REE price is the p at which supply equals demand and through which people form their demand by asking how much of the security they would want at p, if p were the market clearing price.

The REE notion of demand corresponds to the way demand is expressed in real securities markets. Demand is expressed by limit orders, which are instructions to a broker as to how much to buy at a particular price p, if that is the best offer. A person who submits a limit order to buy below the current market recognizes that his order will be executed only if the best offer falls, and on average this will tend to occur when there is bad news about the security. His willingness to buy should incorporate the bad news implicit in his success in buying at a particular price. A market order is an extreme type of limit order which specifies, for example, buy 100 shares at any price as long as that is the market clearing price (or the best price available).

The REE approach concludes that in some circumstances prices aggregate and transmit information in such a way that individuals end up holding portfolios that they never would have chosen based upon their own information, but which they would have chosen had they had *all* currently available information.[8] Generally, these informationally efficient equilibria occur in situations where there is really no reason for trade other than someone having an informational advantage, i.e., where passive investing is optimal.

In general, there may be many reasons for trade other than information. After all, the traditional view of a market is of a location where resources are reallocated. Reasons for these noninformational trades include cross-sectional changes in wealth, risk preferences, liquidity needs, unanticipated investment opportunities, and all factors that do not directly relate to the payoffs on the securities being traded. Some prominent examples of allocational price movements, in two very different markets, are the fall in global equity prices associated with the 1987 crash, and the rise in real interest rates in Germany following German unification in 1990. In the case of the crash, October 19,

[7] In essence, a classical demand function asks: for each particular, arbitrarily chosen price, how much would I want at that price? The price, which equates total demand to supply, will be a result of the information expressed in each person's demand function, but each person ignores this fact in forming his demand. Therefore, this price will not really clear the market. Each person will learn something about aggregate information from the price that equated demand to supply, and this information will lead him to revise his demand.

[8] See Theorems 1, 2, and 3 in Grossman (1981).

1987 did not begin with negative earnings announcements.[9] It began with a significant fraction of investors becoming more risk averse about equities, thus seeking to reduce their equity holdings. Prices were marked down to induce other investors to increase their holdings. There was unusually heavy volume as prices moved to reallocate resources, rather than to reflect information about payoffs. German unification was another important allocational event, and the massive capital expenditure needed to rebuild East Germany and to finance the transfer payments from the West Germans to the East Germans raised the West German demand for capital.[10] German interest rates rose relative to the United States and Japan to induce a flow of capital into Germany.[11] The rise in the German-United States interest rate differential was not a reflection of market anticipation of a depreciation of the German currency; it was a real reward offered to the world for investing more in a particular type of risk, namely, the risk of deutschemark-denominated assets.

In general, allocational price moves are relatively more important in global markets, since *countries* have nonsynchronized business cycles and are subject to different political risks and to different shocks to their investment opportunities, all of which are associated with capital flows that are facilitated by movements in real interest rates. Cross-country reallocations of capital are usually of far greater magnitude than within-country reallocative capital flows. Prices and interest rates change in order to facilitate such global capital flows (allocative price moves), as well as to reflect information about payoffs (informational price moves) such as anticipated changes in exchange rates.

There is another general class of situations where there is noninformational trading, which can serve as noise, thus preventing informational efficiency. It is through thinking about this source that I have arrived at the idea of incomplete equitization as the generalizing principle. This source is the use of dynamic trading strategies to synthesize claims instead of the direct purchase of those claims. For example, if options are not traded, then they can be synthesized. A major accomplishment of modern finance is the

[9] On October 19, 1987, the Dow Jones Industrial Average fell 508 or 22.5 percent (the Standard & Poor's 500 fell 57.64 points or 20.4 percent) and 604.3 million shares were traded on the New York Stock Exchange.

[10] Brady (1990) estimates that German unification will cost the former Federal Republic of Germany a minimum of $147 billion over the next ten years. Since German unification and a few years preceding, Germany has borrowed 15.6, 16.0, 19.9, 28.4, 65.0, 24.8, and 32.9 billion dollars, respectively, from the international capital markets over the years 1988 through 1994, according to the Organization for Economic Cooperation and Development (1994).

[11] According to Barrell *et al.* (1992), in 1988, before any expectation of a German unification, United States-German (Federal Republic) and Japanese-German short-term interest rate differentials were 3.5 and −0.2 percent, respectively. In 1991, after the October 3, 1990 German unification, interest rate differentials were −3.4 and −2.2 percent, respectively. By 1992, when German borrowing on the international capital markets had peaked, the interest rate differentials were −5.5 and −5.0 percent, respectively.

realization that the securities that are traded are, in some ways, arbitrary bundles of contingent claims. No particular security that is issued will provide the exact payoff pattern sought by each investor, so an investor forms a portfolio of securities and dynamically rebalances the exposures to generate a desired payoff. In a world of complete information, it does not matter whether people who want individually tailored payoffs (such as provided by options) synthesize them or whether they achieve the payoffs through direct trade in options or other esoteric securities. I have argued that the prices of options reveal information about the future realized volatility associated with people's dynamic trading plans.[12] If people do not express their demand for income streams through the direct purchase of contingent claims such as options, then the implementation of their dynamic trading plans will appear as allocational trades.

II. Incomplete Equitization

This brings me to the central topic of this address; namely, the concept of incomplete equitization and its relationship to the informational efficiency of markets. Complete equitization of risks is the situation where all individuals have sold claims to all their future income streams and use the wealth so obtained to purchase claims to all of their present and future consumption and investment needs. Clearly, if there is complete equitization, then there is no dynamic trading; no one needs to dynamically sell securities to finance consumption or investment, since all consumption claims are purchased once and for all at the beginning of time. Here we have the purest case of passive investing. Markets would be informationally efficient because there is no allocational trading; anyone offering to trade would be doing so only because they possess private information, and no one would trade with such a person except at prices that already incorporate his information.

Complete equitization should not be confused with complete contingent claims markets. For example, consider a pure exchange economy of complete certainty with two types of investors, who differ only because of the timing of their income streams, but with the same present value. In equilibrium, each will consume his per-capita share of aggregate income. If there is complete equitization, then each person equitizes his income stream by selling claims to it, purchases an annuity, and never trades again. With incomplete equitization, but complete markets, there is trading on each day, as the person with a low income on that day enters the loan market to borrow, and the person with high income enters the loan market to lend. A particular person will be a bond buyer on some days and a bond seller on other days. Bond trading is caused by the failure to equitize, not by a failure of markets to be

[12] See Grossman (1988a, 1988b, 1988c).

dynamically complete. Indeed, if there is only a loan market and not an annuity market, then the dynamic trading of bonds synthesizes the annuity.[13]

What difference does it make how we synthesize payoffs? What is the difference between actively trading bonds and passively holding an annuity? There is an enormous difference in the informational demands placed on the economic system in the dynamic trading version. Once we take the realistic view that all individuals do not share common information about what aggregate income will be at each date, then the dynamic trading version requires them to make inferences about the future path of bond prices at each point in time, while an environment that equitized all income flows at the initial date would require only the passive strategy of holding the market portfolio.[14] In the dynamic trading version, a person must ask are bonds being sold now because others have low current income and are merely trying to finance consumption, or are bonds being sold because someone knows that interest rates will rise. In other words, when passive investing is not optimal, bond trades will always have an allocational role, which will both decrease the informativeness of prices and make it more difficult to synthesize the desired state contingent payoffs.

There are numerous sources of incomplete equitization. Obviously, human capital is not easy to equitize, so people are forced to dynamically enter the loan market and securities markets for limited liability corporate equities. If people were to equitize their human capital completely, there would be enormous incentive and moral hazard problems. Natural resources are not always equitized, sometimes because their exploitation requires human capital, which cannot be equitized, or sometimes for political reasons, as in the case of countries unable to assure foreigners that their property rights will be respected.[15] The occasional failure to equitize natural resources, inventories of goods, raw materials, and grains creates dynamic trading in futures, as owners hedge positions.

Owners of foreign currency receivables have not equitized the receivables, and this leads to the use of currency forward transactions to dynamically hedge the receivable. More generally, all currency transactions represent temporary stores of value, where assets are accumulated to pay for future consumption. Nominal assets are held only temporarily and represent a dynamic asset position designed to deal with the asynchronization of expenditures and receipts. Nominal assets would not exist in a world where all future income streams were equitized and the wealth was used to purchase future consumption streams. Whenever we see asset positions bought for the purpose of later disposal, we are seeing a dynamic response to some sort of incomplete equitization.

[13] See Grossman and Weiss (1984), where it is shown that this occurs even when income streams are uncertain.

[14] See Grossman and Weiss (1982).

[15] Consider a copper mine, where the extraction of the copper requires much labor, machinery, and management skill. The sale of the mine without the management may have little value. The copper, however, can be sold forward.

The fact that zero-sum contracts, such as futures and insurance, are traded is evidence of the importance of incomplete equitization and dynamic risk sharing. Someone who acquires an inventory does so because of an anticipated benefit from being able to control it directly. To equitize it would be to give up exactly the control rights that are the reasons for the purchase of the inventory. Instead of giving up ownership, the holder may choose to reduce risk by selling the *risk* off dynamically, using futures or forward contracts. In many cases, a grain dealer, bond dealer, or the holder of a foreign currency receivable finds enough value in the ownership of the underlying asset, because of the control rights such ownership conveys, that he prefers to partially hedge the income risk rather than losing control rights.[16] Unlike our own world, in a world of complete equitization no individual's consumption would be tied to the performance of his own activity, firm, or country.

III. Dynamic Trading Strategies and Incomplete Equitization

In general, it is the use of dynamic trading strategies to synthesize payoffs that provides the largest class of deviations from passive investments. The typical intertemporal optimization takes an arbitrary set of securities and finds a dynamic trading strategy to synthesize a set of final payoffs. It has been insufficiently emphasized that the dynamics of the trading strategy is an artifact of the arbitrary bundle of contingent claims embedded in the security. For example, if markets are dynamically complete (i.e., there are a sufficient number of securities to synthesize a payoff that is an arbitrary function of the sources of uncertainty), then individuals will find it optimal to choose trading plans so that each person's consumption will be a nonstochastic function of aggregate consumption, but the particular trades that are done to implement this outcome will be highly dependent on the (essentially arbitrary) characteristics of available securities.[17] For us, the crucial questions are: what portfolio of traded securities synthesizes the consumption claim? And, is it active or passive, and what informational demands does it make on the system?

First, consider the case where markets are synthetically complete and where the portfolio opportunity set is a constant. Then, all investors will hold the same portfolio of risky assets. In general, however, they will not be passive investors because they must dynamically change the proportions of their wealth between a risk-free asset and the portfolio of risky assets. To comprehend how unpassive such a strategy is, just recall October 19, 1987, which is easily interpretable as investors simply shifting between the market portfolio and the risk-free asset! It is interesting to note that the failure of passive investing, associated with shifts between a risky asset and a risk-free asset, is an artifact of the definition of the risky securities. It can be proved that if there are n types of investors, then there exist n securities, each with

[16] See Grossman and Hart (1986).

[17] For example, see Merton (1990).

a payoff that is a different nonlinear function of aggregate consumption, such that each investor can passively hold such a portfolio—with no rebalancing between risky and risk-free assets.[18]

The next case to consider is where there is a stochastic opportunity set, say, from a stochastic interest rate, and/or a stochastic mean and covariance matrix of returns.[19] Even if markets are complete, it is generally not optimal for investors to hold the same portfolio of risky assets. Generally, this is because securities will be used to hedge against changes in the investment opportunity set. What has not been emphasized is that the investment opportunity set needs hedging exactly because of the dynamic manner in which securities are used to generate consumption streams. In particular, by the same argument used when the investment opportunity set is constant, it can be shown that there exist new securities, possibly tailored to individuals, such that a passive investment in these securities is optimal. This follows simply because, even with stochastic investment opportunities, each person's consumption is determined by aggregate consumption (when markets are complete). Therefore, if each person bought his particular nonlinear function of aggregate consumption when he securitized his income streams, there would be no need for further trade.

The fact that individuals cannot usually securitize their future income makes it impossible for them to engage in a once-and-for-all trade where they purchase the appropriate nonlinear claim to their share of aggregate consumption. Thus, most individuals will attempt to achieve their consumption by dynamic trading strategies. Nevertheless, there will be many types of nonlinear claims which individuals will desire to hold.

The optimality of nonlinear claims is a fancy way of stating that securities like options often provide the type of payoff investors desire. This is not a particularly radical statement; after all, ordinary limited liability common stock on a firm that has debt resembles a call option on the corporation's underlying profitability far more than it resembles a linear claim. The prominence of such limited loss securities provides strong evidence that there is a large class of investors who desire call-like payoffs. It is well known that, in a dynamically complete market, the optimal investment strategy for an investor who wants to limit his fall in wealth from investments in risky assets to some prespecified level will be to adjust his exposure to the risky asset in such a way that he overlays on his portfolio the payoff of a put option

[18] In equilibrium, every individual will choose an optimal consumption stream and portfolio strategy with which to finance that consumption. If, however, individuals are offered a personally tailored security whose payoffs match those of their optimal stream (and are charged a price equal to their initial wealth for the security), then they will be indifferent between holding the personally tailored security and synthesizing its payoffs by dynamic trading, using other securities. This proves the statement that securities can be constructed such that investors would be passive holders of such securities.

[19] See Merton (1973).

with a strike equal to the prespecified minimum wealth on his stock position.[20] The put overlay is synthesized by selling risky assets as they fall in value and buying risky assets as they rise in value.

Suppose that a substantial number of investors desire put-protected payoffs on the market at a strike, say, 10 percent below the current level of the market. Consider two alternative methods by which this could be achieved. First, investors choose passive strategies in traded options, while the second method is through the use of dynamic trading strategies in the stock. In the passive method, investors express their demands in the current marketplace, and the current price of options reveals to them what is the cost of their strategy. The implied volatility (function) at which the options trade represents the price paid by option buyers. The greater the demand for put options, the higher will be the implied volatility at which they trade. Indeed, the inducement for investors to be suppliers of put-like payoffs (which requires holding more risky assets after a price fall and less risky assets after a price rise) is a higher risk-premium when prices are low and a lower risk-premium when prices are high. This will cause actual future volatility to be higher, since bad news will raise the risk premium, while good news will lower it. If markets are indeed complete, then the increase in the demand for put-like payoffs will cause implied volatility to rise to reflect exactly the future increase in realized volatility.

Thus, if people's demands are reflected in passive investments, the prices of these investments will rise to reflect fully their scarcity. If people's demands are inconsistent with what is feasible then prices will adjust to discourage those demands. For example, if everyone in the economy were to decide that they want put-protected payoffs on risky equity, so that they could never lose money, then implied volatility would rise to infinity.

But what of the second approach, where, instead of expressing demands for options, people simply plan to synthesize the options? Suppose people make their plans assuming a volatility of, say, 17 percent; then what will the actual volatility be? Their demands may well make it higher than 17 percent. For reasons given earlier, the actual volatility will depend upon how many people are synthesizing put-protected payoffs, as well as the strikes and maturities, of the synthetic options. If everyone knows all of these essentially private characteristics of the economy, then they may well forecast correctly. This need to know so much, however, is a consequence of the failure to trade in real options markets; it is a consequence of the inadequacy of traded securities to generate passive strategies in those securities. In the absence of securities in which people passively invest, there is no current price to reflect the future scarcity of the resources that are being implicitly demanded. If everyone wants to synthesize put-protected payoffs, then risk-bearing capacity will be very scarce when some bad news arrives.[21]

[20] See Cox and Leland (1982) and Grossman and Vila (1989).
[21] See Grossman (1988a).

IV. Passive Investing

The above remarks bring me back to the topic of passive investing. Capital asset pricing theory has not been very successful in explaining the risk premia of securities; however, it has been incredibly successful in influencing the portfolios chosen by institutional investors.[22] Prior to 1970, there were virtually no equity-indexed funds.[23] Today, there are probably over 500 billion dollars invested in indexed funds or with managers who must essentially index to meet performance benchmarks based upon an index.[24] As promulgated by financial theory, these equity indexes are capitalization-weighted. Financial theory has provided investors with a remarkable result: you do not need to know the mean or covariance matrix of returns—all that you need to know is the market capitalization of a corporation. If a corporation is listed on an exchange, then it belongs in your portfolio. The bigger it is, the more you should possess. This is an amazing economy of information.

There are two reasons why this is just too good to be true, and both reasons are associated with incomplete equitization. First, in the absence of complete equitization, there will be trade, and someone must figure out the correct price of the securities; the correct market capitalization must come from somewhere. If it is costly to value securities, then those who bear this cost must outperform those who do not.

There is a second reason why indexation based upon market capitalization is wrong in our world of incomplete equitization; namely, risk is shared by means other than equities. To see this, consider the following questions:

a. Should the typical investor have a long-run passive exposure to a short position in copper futures?
b. Should the typical investor have a long-run passive exposure to shares of General Motors Corporation (GM)?

The finance profession would give the following answer. The typical investor should not subject himself to the risk of copper futures unless the investor has some special information about copper or has some special hedging need, for example, caused by a positive correlation between the return to his human capital and changes in the price of copper. The typical

[22] Capital asset pricing theory was developed by Sharpe (1964, 1970), Lintner (1965a, 1965b), and Mossin (1966). For a review of the empirical evidence against capital asset pricing theory, see Roll and Ross (1994).

[23] See Gartland (1994). The first index funds were introduced in 1971 in the United States and 1983 in the United Kingdom.

[24] *Pensions and Investments* (1994) reports that total domestic (United States and Canada) investment in indexed funds was $452.5 billion as of January 1, 1994. The figure is drawn from a survey of 2,400 banks, trust companies, insurance companies, and independent investment management organizations with 861 respondents. Since not all companies chose to respond and because not all index-linked funds were reported as index funds, the figure provides a lower-bound estimate of investment in index-linked funds. On the other hand, Greenwich Associates finds that passive investment comprises $492.6 billion (18.6 percent) of a fund universe consisting of $2.656 trillion in assets in 1994.

investor, however, should invest in a portfolio of listed securities, and his investment in GM should be roughly in proportion to its market value. Note that this conclusion is reached without a need to analyze the business of GM or the business prospects of GM. As long as GM's assets are properly valued in the market, then GM should be held in equilibrium in proportion to its equilibrium capitalization.

To see the error in these conclusions, consider what would happen if someone sets up a corporation with equity of $100 million. Suppose this company invests all of the capital in Treasury bills and takes a $100 million short position in copper futures. The market value of this company will be $100 million. Now, suppose this company is listed on a stock exchange. The equity of this company is now an asset that must be held in equilibrium, so by the same argument we gave for GM, shares of this company belong in the market portfolio and in the typical investor's portfolio. Yet, this company has the same excess return as a short position in copper futures. We therefore conclude that a short position in copper futures belongs in the investor's portfolio! This is a reductio ad absurdum.

A security does not belong in a portfolio merely because it is listed and priced in equilibrium. Surely, the mere fact that a particular bottle of wine is priced correctly does not mean that the bottle is the appropriate consumption good for every consumer. Similarly, if everyone does not equitize their income streams, then different people will have different sources of nonequitized risks, and it will not be optimal for everyone to hold the market portfolio of listed securities. The listed securities are a particular selection of risks that people have decided to equitize; they do not represent the market portfolio in the sense in which it is used in asset pricing theory. Therefore, as the above example shows, the market portfolio of listed equities will not be optimal in the presence of other methods by which risk is shared. To provide an empirical perspective of this, the daily volume of futures trading, currency forward trading, and other forms of forward trading is well over one trillion dollars and average open interest is probably five times that level.[25] If property insurance is included in nonequitized risk sharing, then the amount of nonequitized risk sharing is clearly larger than the amount of equitized risk sharing.

The above example shows that it is not optimal for all investors to hold a security only because it is listed and priced correctly. There is a fundamental

[25] According to the Global Derivatives Study Group (1993), the daily volume of activity in forward contracts is estimated as $420 billion (p. 30). The Bank for International Settlements (1994) estimates that year-end, open interest, notional value was $7.839 trillion for exchange-traded derivatives in 1993 and $5.346 trillion for over-the-counter derivatives in 1992. By comparison, the Bank for International Settlements (1994) reports that the amounts outstanding for all bonds, notes, and other debt securities (public and private) were $19.354 trillion, and the market value of the Financial Times Actuaries World Index for exchange traded equities was $8.698 trillion at the end of 1993.

difference between our theoretical construct of a security as a claim to some exogenous risky income stream and the kinds of securities actually listed and held in our portfolios. There are virtually no exogenous income streams.

Almost all corporate income is a result of active management decisions, not the passive passthrough of property income.[26] Fundamentally, what we call passive investment in listed equities is nothing more than the delegation of active risk management to someone else. Corporate management decides which risky investments to make and what degree of leverage to use. Many institutional investors believe that by purchasing the market portfolio of listed securities, they are not making any active investment decision, and they are not using leverage or derivatives. They do not realize that ordinary common stock is a derivative written on the underlying profitability of the firm and that the common stock is a leveraged investment in the underlying profitability of a firm whenever the firm has debt outstanding. In effect, the investor has delegated the choice of leverage to someone else. What is the fundamental difference between (a) hiring an active portfolio manager, who picks stocks or currency positions and uses leverage, and (b) passively investing in a portfolio of stocks, where the managers of the firm are choosing leveraged global risky investments? I believe that there are differences, but they are not fundamental.

In essence, we have such incomplete equitization that there is simply no such thing as a passive investment. Incomplete equitization means that new risky investment opportunities will constantly arise. Someone must value these and allocate capital toward them. Similarly, new risk bearing opportunities constantly arise, and someone must make the decision as to whether and how they are to be borne.

V. Passive Investing and Informational Efficiency

Markets will always be, at least to some extent, informationally inefficient as long as all risks have not been equitized. There will always be noninformational trade, and there will always be a signal extraction problem. Where should we expect to find evidence of this noninformational, allocational trading? Allocational trading is based upon systematic differences between investors. Such systematic differences are quite apparent across investors in different countries.

Incomplete equitization in global markets is the rule rather than the exception. It is well known that investors have not totally diversified internationally among listed securities.[27] But this failure to completely diversify among listed securities is trivial in comparison to the failure to diversify across nonlisted claims to income. What fraction of total wealth, including real estate, human capital, and natural resources, is held domestically? I would be surprised if this number is below 75 percent for any major country.

[26] A related viewpoint is expressed by Garcia and Gould (1991).

[27] See, for example, French and Poterba (1991).

With complete equitization, all such claims would be sold in a global market. All business cycles would be completely synchronized, and, for example, oil-producing countries would not be adversely affected by a fall in oil prices, and Mexicans would not be adversely affected by a devaluation of the peso.

One important expression of this global failure of complete equitization is the well-known empirical result that, for major currencies, high nominal interest rate differentials over the U.S. interest rate have been associated with high U.S. dollar excess returns to investing in foreign money market instruments.[28] I believe that this is a consequence of the central banks of the major countries maintaining a monetary policy consistent with preventing capital outflows, or causing capital inflows in response to high domestic consumption or investment needs. Another expression of the allocational role of global interest rate differentials is the high average excess returns earned by hedge funds from currency trading, surely on average outperforming actively managed equity funds over the last 15 years.[29] These returns may have been earned by investing resources in distinguishing allocational interest rate moves from informational moves, and appropriately causing capital to flow globally to its best use.

Allocational events do not, in and of themselves, lead to inefficiency. They merely lead to variability in expected returns and the suboptimality of passive strategies. The suboptimality of passive strategies means that someone has to make allocational decisions and earn excess returns if it is costly to make those decisions in an informed and timely manner.

VI. Conclusion

The price system is an amazing allocator of resources. If the final consumptions people desire are priced in the market, then market clearing prices will cause a coherence between what people privately desire and what is socially feasible. If, on the other hand, people attempt to achieve their final goals by planning to trade particular assets dynamically, then the price system alone will not make their plans cohere. There are incentives to directly collect information, to help forecast the dynamic feasibility of people's plans, and to attempt to profit from their inability to realize their plans. The attempts to profit from collecting information about such feasibility enhances the informativeness of the price system and helps the plans cohere by the transmittal and aggregation of information.

[28] See, for example, Cumby and Obstfeld (1981).

[29] This statement is based upon my informal observations; however, the Frank Russell Company Private Partnerships Universe reports that the annualized return for global and international hedge funds was 24.2 percent over the last seven years (1988 through 1994). By comparison, the Standard and Poor's 500 Index had an annualized average return of 13.47 percent.

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