



THE INSTITUTE
FOR QUANTITATIVE
RESEARCH IN FINANCE

The **Q** Group

Spring 1995 Seminar,
The Peabody, Orlando, FL

March 26-29, 1995

NEW ISSUES IN
ACTIVE MANAGEMENT
AND INFLATION

**INSTITUTE FOR QUANTITATIVE
RESEARCH IN FINANCE**

SUMMARY

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I. INTRODUCTION: SUMMARY AND CONCLUSIONS

The opening address at the Spring 1995 Seminar was given by Sheila L. Tschinkel, Senior Vice President and Director of Research at the Federal Reserve Bank of Atlanta. Her topic was the effectiveness of monetary policy in dealing with inflation.

The Monday sessions dealt with inflation. Lawrence Harris introduced the topic, discussing monetary policy and inflation, and reviewing the historical data on velocity of money. Kenneth Rogoff continued the discussion of central bank policy and introduced the importance of political objectives and the differences between economic activity under Republican and Democratic Administrations. Campbell Harvey presented data on the relationship between rate of return and variability in returns for the United States and other countries. He went on to consider inflation and economic activity and their impact on the diversification benefits of foreign investment. Robert Whitelaw discussed inflation forecasting and the use of stocks of different industries as well as commodities as inflation hedges. Brian Motley considered the relation between inflation and economic growth in a number of countries, comparing the costs and benefits of inflation control.

Tuesday's sessions were focused on active management. Robert Shultz introduced the topic and John Freeman discussed the "deadweight" problem with an actively managed portfolio, and ways to solve it. William Jacques continued the discussion of inefficiency in traditional active management and ways to make better use of manager skills. Ronald Kahn offered a number of quantitative measures of active manager skill and ways to make the best use of it. Jack Treynor set out a model of active management as a game among skilled adversaries and showed the importance of accurately assessing the trading motives of counterparties to a trade. Albert Kyle discussed the agency problem in the investor/manager relationship and ways to deal with it. Robert Ferguson presented an analysis of performance fees, linking expected manager behavior to the fee structure.

On Wednesday, David Tierney continued Monday's discussion of "deadweight" in actively managed portfolios with a proposal to use a Dynamic Completeness Fund to reduce misfit risk. Eric Sorenson traced the relationship between rate of return and changes in return volatility of stocks and described a trading model that uses derivatives to exploit forecasting opportunities.

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1. Inflation: What Causes It To Change?

The opening address at the Spring 1995 Seminar was given by Sheila L. Tschinkel, Senior Vice President and Director of Research at the Federal Reserve Bank of Atlanta.

She distinguished two causes of inflation: an excess aggregate demand over aggregate supply, and expectations of inflation that cause acceleration of purchases. Expectations may be adaptive, responding to the most recent events, or flexible, taking a longer historical view and separating cyclical from permanent changes in inflation. In either case expectations are significantly affected by the credibility of the central bank's efforts to curb inflation. If a central bank has zero credibility, then forward-looking expectations appear as if they are adaptive. Once inflation emerges, it is expected to continue.

If the central bank is dealing with the adaptive model of inflation expectations, the emergence of inflation calls for very prompt action. If the central bank is dealing with a flexible model of inflation expectations, this situation may permit it to allow cyclical causes of inflation to run their course. At this time, she said, we also need to consider whether the credibility of the U. S. central bank has increased because of its success in reducing inflation over the past 15 years. While it is likely that it has, it is difficult to know by how much, and this makes it difficult to chart the course of policy.

2. Introduction: The Importance of Inflation

Lawrence Harris, Professor at the School of Business Administration, University of Southern California, and Research Coordinator for the Q Group, introduced the Inflation topic. He suggested that the three most important factors in investment analysis are inflation, the equity risk premium, and political risk, but that they rarely receive the attention they deserve. The purpose of the Monday presentations was, in part, to make up for this deficiency.

He presented the familiar equation $PQ = VM$, which in words expresses the equality between the price level times the quantity of economic activity and the velocity of money

times the money supply. A brief graphical presentation for the period 1972-1993 used the Consumer Price Index for P , the Index of Industrial Production for Q , and $M2$ for M . The velocity V was calculated from these three variables, and although there was substantial year-to-year variability, over the two decades V was almost always between 3 and 3.5, and there appeared to be no trend. Harris added a graph of short-term interest rates and showed that the velocity traced short-term rates very closely until about the last three years. As another example, he used the same parameters for Greece that he had used for the United States, and once again the velocity had been very stable.

In commenting on the experience of recent years he pointed out that transaction technology, which has changed significantly, will have a large effect on the velocity of money. In addition, it is increasingly difficult to know just what "money" consists of.

While monetary policy is intended to create stable prices, it is difficult to target prices themselves because price movements generally lag monetary policy. At the same time, targeting interest rates has not worked and it is extremely difficult to control the money supply. In trying to find an indicator on which to focus, Harris suggested there is probably a tendency to look at the capacity of the economy.

3. The Political Economy of Inflation

Kenneth Rogoff, Professor at Princeton University, offered some perspectives on political determinants of inflation. There has been some research on the political/business cycle. The theory here is that politicians in power attempt to build up the economy, particularly to build up employment, on the eve of an election. The buildup may indeed increase inflation, but the inflation effects will lag the economic surge, and not be felt until after the election. The evidence to support this theory is rather weak, although Rogoff pointed out that President Nixon's 1972 campaign stood out as an extreme example supporting the theory. However, there is stronger evidence to support the theory of a political/budget cycle. The governmental activity here is likely to have to do with taxes and budgets.

Another theory has to do with a partisan business/political cycle. Here, one expects that following the election a Republican administration will deliver lower inflation than a Democratic administration. The evidence appears to be that economic activity following an election does differ between Republican and Democratic victories, but the effect is very short-lived. The Gross Domestic Product growth in the second quarter following the election of a number of Democratic presidents was at a 6.2% rate, while following the election of a number of Republican presidents it was -.3%. But the differential disappeared in subsequent quarters.

Turning to the role of the Central Bank in controlling inflation, Rogoff set out in algebraic form the objectives of the private sector with respect to inflation, and the objectives of a central bank. The private sector wants to minimize the error in predicting inflation. Businesses establishing wage contracts want those contracts to incorporate as accurate an inflation estimate as possible. And those buying long-term bonds want, of course, to properly incorporate inflation in the yields they accept. The Central Bank objective is a little different. The monetary authority wants to add to the inflation expectation a "wedge" and in addition to add (or subtract) inflation to counteract shocks to the economy. There are various purposes to the wedge, including the reduction of the real value of the public debt. The problem the monetary authority has is that rational expectations will tend over time to frustrate its objectives. The private sector comes in time to anticipate the "wedge" as well as the response to economic shocks.

The ideal Central Bank policy should be to eliminate systematic inflation, using its authority only to respond to the shocks. How might this ideal be achieved? A truly independent Central Bank with conservative management is one answer. The Bundesbank may be the closest approximation, but the Bundesbank will not even respond to economic shocks. Rogoff presented a graph plotting for a number of countries the average inflation from 1960-1988 against the degree of independence of the Central Bank. It appeared that low inflation did indeed accompany a high level of independence.

Pursuing the topic of the credibility of the Central Bank in dealing with inflation, Rogoff

presented a number of graphs showing real exchange rates. The real value of the peso per U.S. dollar, the real value of the pesata per deutschmark, and the real value of the lira per deutschmark, all showed evidence of a serious lack of faith that inflation would be controlled and fixed exchange rates would hold. And in all three cases the end result was significant devaluation.

Turning to yields on long-term bonds today in the United States, Rogoff concluded that the steepening of the yield curve reflects a lack of credibility of Central Bank efforts to control inflation. He also suggested that the decline in the United States dollar reflects fear of U.S. inflation.

In conclusion, although the rate of inflation in the United States is very low today and has been low in recent years, it would be dangerous to ignore the possibility of an increase. We can see in the collapse of the dollar and high yields on long-term bonds evidence of uncertainty. A desire to further reduce unemployment and a wish to eliminate deficits without tax increases are also forces suggesting increased inflation.

4. Inflation and World Equity Selection

Campbell R. Harvey, Associate Professor of Finance at The Fuqua School of Business, Duke University, distributed a paper by himself and Claude B. Erb and Tadas E. Viskanta entitled "Inflation and World Equity Selection." He began his presentation by noting that many managers engaged in asset allocation have moved away from unconditional allocations in which they make use of long-term average performance characteristics, to the use of characteristics consistent with the most recent state of the economy. It is particularly important to get the expected returns on the different assets classes correct, but Harvey also observed that we should not ignore getting the variability measures right.

As a specific application of the importance of conditional forecasts, Harvey considered the use of foreign stock and bond markets in hedging the risk in U.S. equity investments. The value of the hedging depends greatly on the correlation of returns in foreign countries with

returns on U.S. equities. And these correlations change over time. We want to know why.

Harvey described the data on which his conclusions would be based. For each of the countries in two groups — developed countries and emerging economies — these data included rates of return, volatility in those rates, covariances with U.S. equity returns, and correlations with U.S. equity returns. He began by splitting the data between months in which U.S. stocks showed positive returns and months in which they showed negative returns. It is in those latter months that we would like to take advantage of the diversification benefits of foreign investment. But what Harvey found was that almost all countries showed on average negative returns when the U.S. returns were negative. He also found that when U.S. returns were negative the variability of returns in foreign countries was relatively high. The end result is that just when we would hope for benefits from foreign diversification those benefits are small.

Next Harvey split the data by the state of the economy: months of economic expansion and months of economic recession in the United States. Returns in foreign countries tended to be low in periods of U.S. recession and high in periods of U.S. expansion. Volatilities in foreign returns were somewhat lower in U.S. recessions; covariances were very much higher; and correlations were higher. We can conclude here that the state of the business cycle is important to the diversification benefits of foreign investment. And Harvey's contention was that we are better able to forecast the state of the economy than we are able to forecast equity returns.

Finally, Harvey examined the significance of inflation as a state variable. For the foreign countries, as with the United States, equity returns were generally higher in low inflation periods. This was true of returns measured in local currency. But historically there has been a positive relationship between a country's average inflation experience and the total U.S. dollar return of its equity market. Volatility in U.S. dollar returns was also positively correlated with inflation in the foreign country. It is future inflation, of course, that really matters and while realized inflation provides useful information

about the inflation of the next period, Harvey's research used forward-looking country credit risk measures to proxy inflation expectations. In general, the lower a country's perceived sovereign credit rating the higher the country's rate of inflation and the higher the rate of return on the country's stock and bond markets.

In conclusion, Harvey had demonstrated how expected returns, variability, covariance and correlation for returns in foreign countries used to hedge U.S. equity returns are impacted by bull and bear markets in the United States, the U.S. business cycle, and inflation. Asset allocation involving the use of foreign markets should take these impacts carefully into consideration.

5. Commodity Prices and Inflation

Robert F. Whitelaw, Assistant Professor of Finance, Stern School of Business, New York University distributed an outline by Jacob Boudoukh, Matthew Richardson, Paul Richardson, and himself entitled "Stocks, Commodities, Interest Rates and Inflation." He began his presentation by observing on the great importance that the investment community and the financial press seem to attach to the prospects for inflation. Every economic event that might suggest rising inflation and hence rising interest rates is reported as negative news for the stock market. There is indeed empirical evidence that contemporaneous stock returns and inflation are negatively correlated. Whitelaw described his task as discussing the measurement of inflation, the modeling of expected inflation, explaining the relationship between stock returns and inflation and between commodity prices and inflation, and discussing commodity prices and interest rates. He began with five measures of inflation. First was the Consumer Price Index. Then came three producer price indexes — one for finished goods, one for intermediate materials, and one for crude materials. Finally, there was the Goldman Sachs Commodities Index. The monthly mean values and standard deviations differed substantially among the five. He chose the CPI and the PPI (Crude) as the two indexes to use for the balance of his presentation. The standard deviation of the PPI (C) was some six times the standard deviation for the CPI, but in

general the two series appeared to move together. All five measures were reasonably highly correlated, except for the CPI and the PPI (C).

The next step was to divide inflation into its expected and unexpected components. The reason is that returns on any asset presumably compensate investors for expected inflation but cannot compensate for unexpected inflation, leaving a need to hedge unexpected inflation.

In developing a good model for expected inflation, candidate explanatory variables are lagged inflation, interest rates, commodity prices, and gold prices. It turns out that CPI inflation is explained primarily by lagged CPI inflation and the three-month treasury bill yield. Lagged PPI (C) inflation is statistically significant but probably not economically significant. Gold is not significant at all. For PPI (C) inflation, lagged CPI inflation is a useful predictor, the Goldman Sachs Commodity Index is the best predictor, and gold is statistically, but probably not economically, significant. Whitelaw's conclusions with respect to modeling expected inflation were that CPI inflation is much more predictable than PPI (C) inflation, Goldman Sachs Commodity Index has some predictive power for CPI inflation, and excellent predictive power for PPI (C) inflation, and gold is not as helpful as a predictor as many seem to believe.

Whitelaw next turned to the relationship between stock returns and inflation. The Fisher model says that returns on real assets (including stocks) should be unaffected by changes in nominal prices, but we know empirically that stock returns are negatively related to both expected and realized inflation. The two conclusions can be reconciled if inflation is actually correlated with future real output. A correlation analysis of industrial production for individual industries with aggregate industrial production identified cyclical and noncyclical industries. The cyclical industries show high correlation while the noncyclical industries show low correlation. The noncyclical industries tend to show reasonably high correlation with expected inflation, but only mining provided a good hedge against unexpected inflation. The research also found that as the time horizon is extended to one year,

the regression coefficient on expected inflation moves towards 1, and at a five-year horizon the coefficient is above 1 and the coefficient on realized inflation becomes significant. That is, at a five-year horizon stocks do provide an inflation hedge.

Whitelaw next turned to the use of commodities to hedge inflation. He first showed that individual commodity sectors have extremely variable prices and there is low correlation between sectors. All of the various commodity prices appeared to lead the PPI (C). Regression results showed that precious metals, energy and the Equally-weighted Commodity Index all show a potential to hedge inflation.

Finally, Whitelaw had investigated whether the Federal Reserve appears to be using commodity prices in order to determine monetary policy, and hence whether commodity prices may predict the federal funds target and short term interest rates. It turns out that lagged interest rates explain most of current rates, but the Goldman Sachs Commodity Index does have some marginal predictive power with respect to the three-month treasury bill yield.

In conclusion, Whitelaw observed that commodity prices help improve inflation forecasts, that commodities (especially precious metals and energy) show the potential to hedge inflation and stock returns, and that commodity prices help to predict interest rate movements.

6. Growth and Inflation: A Cross-Country Study

Brian Motley, Research Officer at the Federal Reserve Bank of San Francisco, presented a paper entitled "Growth and Inflation: A Cross-Country Study." He offered the widely accepted proposition that inflation has bad economic effects. One of these is a reduction in the level and growth rate of GDP. Motley had undertaken to examine the effects of inflation on economic growth, drawing on data from a number of countries, and then to compare the economic costs and benefits, in present value terms, of a Central Bank policy that curbs inflation. He based his research on Robert Solow's neoclassical growth model as extended by Mankiw, Romer and Weil. The model sets

the log of real income per worker in the steady state as a function of the level of technology, the growth rate of technology, the growth rate of the labor force, the depreciation rate for tangible and human capital, investment in tangible capital as a share of GDP, and investment in human capital as a share of GDP. (Motley discussed some of the problems in the data, including how investment in human capital is to be measured.) Cross-sectional regressions were run for five large samples of countries over a 30-year period from 1960-1990. Because the results might be seriously affected by supply shocks and it is difficult to identify all of the supply shocks in all of the countries over the 30-year period, the regressions were also run for each of the three decades in this period.

The first set of results was for the full 30-year period. For the OECD countries, it turned out that in long-run steady state, a 10% inflation rate will reduce annual per capita growth by about 1.4%. A further interesting result was that the marginal effect of inflation is relatively high for inflation rates between 5-15%, and much lower for inflation rates below 5% and above 15%. For the very high inflation rates it seems likely that institutions and activities develop to enable economic agents to reduce the consequences of inflation. In addition, there may be a measurement bias in the output data because activities intended only to counter the high inflation may boost the measured GDP of high-inflation countries.

Motley concluded with a cost/benefit analysis of inflation reduction. It appears that lowering inflation by 5 percentage points would add at least 0.1 percent to steady state growth and perhaps as much as 0.5 percent. With a 40-year working life, a 3% real discount rate, and a reduction in inflation that would yield a 0.1 percent boost to steady state growth, the discounted lifetime income of a typical worker would increase by about 15% of one year's income, while a 0.5 percent boost to steady state growth would be worth almost 140% of one year's income. These estimates of the benefits of lower inflation appear to exceed the costs of bringing inflation down, which have been estimated as amounting to at most 12-15% of one year's GDP for a 5 percentage point reduction in inflation.

7. Overview: A New Perspective on Active Management

Robert E. Shultz introduced the topic of Active Management. In anticipating what some of the other speakers would discuss, and in referring back to some of his own experience, issues that had been discussed at previous Q Group seminars, and some of the ideas of Barr Rosenberg, he stressed some of the longstanding problems of multiple manager active portfolio management. Part of the problem has to do with optimizing portions of the portfolio management process without optimizing the performance of the total portfolio. Part of the problem has to do with whether the focus is on absolute or relative returns. Another part has to do with the "deadweight" issue, to be explored in some detail by other speakers. A number of proposals have been made to deal with these issues, and succeeding speakers would continue the search for answers.

John D. Freeman, Vice President, Martingale Asset Management, began by tracing the evolution of institutional investment management (borrowing in part from Peter Bernstein), characterizing the 1970s by emphasis on stock selection, the 1980s by index management, the 1990s by diversified active management, and forecasting the next decade as characterized by asset class management and long/short active management. His theme was finding more efficient ways to manage money. One path to greater efficiency is the separation of traditional active portfolio management into two components: indexing and long/short management. The traditional method of investment, by which the active manager is given a substantial asset pool and permitted to take only long positions, fails to make the best use of whatever skill the manager has in stock selection. The role of the active manager is essentially to employ skill in overweighting or underweighting stocks relative to some normal benchmark. The best that the manager can do will still lead to a portfolio that includes some holdings of stocks the manager finds unattractive and substantial holdings of stocks the manager favors but that would be included in the benchmark anyway. Freeman referred to the portion of the active portfolio that is actually earning only the index rate of return or less as the "deadweight" portion. This deadweight

introduces a positive hurdle and a defensive drag. The positive hurdle comes from the fact that the benchmark portfolio already contains the stocks favored by the active manager, so that value added over an index return comes entirely from the manager's overweighting. The defensive drag comes from the fact that the portfolio includes some stocks disfavored by the manager. To make any significant impact on the return of the portfolio the manager must have extraordinary judgment. A particular example of wasted talent is shown in the case where the manager has particularly good information with respect to expected poor performance of a small stock and, with a prohibition on short positions, can add little to the overall performance of the portfolio. Freeman also pointed out that combining the individual deadweight percentages of the managers' portfolios gives an even larger deadweight percentage for the total portfolio.

In conclusion, he suggested that active managers should be permitted to sell short, that the benchmark should be a cash return plus some premium, that there should be no deadweight in the portfolio with futures and passive strategies used to gain asset class exposure.

The presentation was picked up by William E. Jacques, Chief Investment Officer, Martingale Asset Management. He reiterated the inefficiency of traditional active management, pointing out the waste of committing large amounts of capital to managers who are able to operate only at the margin. Harking back to some of the introductory comments of Bob Shultz, he pictured multiple managers focused on the appropriate characteristics of their portions of the total fund, without any clear vision of that total fund. He considered ways in which overlapping holdings of multiple managers might be reduced or eliminated and the value of making strictly long portfolios more aggressive, to conclude that the only satisfactory solution is "pure active portfolios" which means portfolios whose managers are permitted to go both long and short.

8. Quantitative Active Management

Ronald N. Kahn, Director of Research, BARRA, distributed a set of material entitled

"Seven Quantitative Insights Into Active Management." He described the process of Active Management as efficiently utilizing superior information. Research, the "art" of the process, produces superior information, while the "engineering" portion of the process carries that superior information into superior performance.

The object of Active Management is to add value through superior forecasting. If the active manager forecast is the same as the consensus forecast, then the portfolio should be the benchmark. The manager adds value in a mean/variance framework according to:

$$VA = \alpha - \lambda\omega^2,$$

where λ measures individual investor preference.

The familiar information ratio is given by:

$$IR = \alpha / \omega.$$

So

$$VA = IR\omega - \lambda\omega^2,$$

and a differentiation gives us the maximum value added:

$$VA^* = (IR)^2 / 4\lambda.$$

For any investor, at any level of risk aversion, the object is to find the highest IR. So the task now is to work out how to do this.

The fundamental Law of Active Management is that:

$$IR = IC \sqrt{BR}$$

A more precise expression is:

$$IR = (IC / \sqrt{1 - IC^2}) \sqrt{BR},$$

but the previous equation will be satisfactory for normal values of IC. In these equations IC is the information coefficient, which is the correlation of forecast and realized residual returns (that is, the skill of the forecaster) and BR is the number

of independent bets taken by the manager per year, which Kahn described as "breadth." The information ratio is then the product of the skill of the manager and the number of independent times that skill is exercised. The product is important because a modest skill level exercised many times can accomplish more than a super skill level exercised infrequently.

Kahn next decomposed the alpha into the product of IC , volatility, and score. In equation form:

$$\begin{aligned}\alpha &= E(r | g) - E(r) \\ &= \text{Cov}(r, g) \text{Var}^{-1}(g) (g - E(g)).\end{aligned}$$

Here $E(r | g)$ is the expected return conditioned on a raw signal (a piece of information) g , and $E(r)$ is the expected return in the absence of this signal. A high covariance between r and g is obviously beneficial, while a high variance in g is not. And one wants the value of the signal g to be greater than the general expectation of g . Kahn observed that we can think of the formula as a Bayesian adjustment to the expected return, as the result of the signal g .

He went on to discuss the perils of datamining and the statistics of datamining. The t -statistic in a regression can be misleading if one forgets that the regression is but one of many seeking a true relationship.

Kahn turned next to the ways in which the implementation process subtracts value from the expected alpha. Transaction costs are obvious, but constraints imposed on the portfolio are another contributing factor. Reducing turnover can be helpful, but rather than simply reducing transactions it is better to schedule the most valuable trades first, take account of differing transactions costs among stocks, and improve the trading function.

Finally he discussed the matter of distinguishing skill from luck. Unfortunately, it takes a very long time to achieve a high level of confidence in the skill of a manager.

9. Active Management As An Adversary Game

Jack L. Treynor, President of Treynor Capital Management, Inc., presented a paper entitled "Active Management As An Adversary Game." His presentation concerned the trading by large institutional investors, acting essentially as adversaries and pitting their skills against one another. (The assumption here is that institutions do rather limited liquidity trading.) This adversary trading is then a zero sum game less transaction costs.

We can think of the consensus value of a stock as a function of a variety of states of information held by different investors and a variety of opinions of market timers. Corresponding to (but not equal to) this consensus will be a market price P' given by:

$$P' = V(x_1, x_2, \dots, u_1, u_2, \dots) + e,$$

where the x_i explain why different securities have different values at the same point in time, and the u_i explain why the same security has different values at different points in time, and e differentiates the market price from the consensus value. The differential in the market price P' , related to changes that will be acted upon by an information motivated stock picker, by a timer, and by a value motivated stock picker are given by:

$$dP' = \sum_i \frac{\partial v}{\partial x} dx + \sum_j \frac{\partial v}{\partial u} du + de.$$

Both buyer and seller are motivated by expectations with respect to dx , du , and de . Both anticipate a change in the market price from P' to P . The relationship between the old and the new prices is given by:

$$P = P' = M_1 + M_2,$$

where M_1 and M_2 are the respective transactors' motives in trading.

We designate by p the equilibrium trade price, which is the price agreed upon by the two parties that satisfies both with respect to price and trade size. If P_1 and P_2 are the transactors' expectations for the new consensus price, then

their expected returns are respectively $P_1 - p$ and $P_2 - p$. Relying next on the Treynor-Black propositions with respect to active holdings, we can represent the desired active positions of the two traders as h_1 and h_2 , where

$$h_1 = H_1 (P_1 - p) \quad \text{and} \quad h_2 = H_2 (P_2 - p),$$

where H_1 and H_2 are factors reflecting risk aversion, portfolio size, etc. Since $h_1 + h_2$ must equal 0 we derive:

$$p = (H_1 P_1 + H_2 P_2) / (H_1 + H_2)$$

for the equilibrium price, and

$$x = \frac{H_1 H_2}{H_1 + H_2} (P_1 - P_2)$$

for the size of the trade. (The algebraic sign on x will be positive for the buyer and negative for the seller.)

So far we have considered the motivations of each party. Now we introduce the expectations each party holds of the motivation of the other. We let (E_1) and (E_2) be the expectations of the respective parties. Then we have

$$P_1 = P' + M_1 + E_1 (M_2)$$

$$P_2 = P' + E_2 (M_1) + M_2.$$

Substituting in previous equations, we are brought to the size of the trade represented by:

$$x = \frac{H_1 H_2}{H_1 + H_2} [(M_2 - E_2 (M_1)) - (M_2 - E_1 (M_2))]$$

and for the rate of return on the trade to the buyer (subscript 1) we obtain:

$$P - p = \frac{H_2 (M_1 - E_2 (M_1)) + H_1 (M_2 - E_1 (M_2))}{H_1 + H_2}$$

Treynor pointed out that a comparison of the last two expressions is instructive. Maximizing the rate of return to the buyer (subscript 1) involves maximizing the expression $M_2 - E_1 (M_2)$, but maximizing this term minimizes the size of the transaction (x is positive for the buyer). The objectives of high

rate of return and large size of transaction are in conflict.

The equation for the return also demonstrates the danger of underestimating the motivation of the other party. Bearing in mind that M_2 (the motivation of the seller) is a negative number, note that if the expectation held by the buyer of the motivations of the seller is an underestimate, then the return will be disappointing. Treynor's observation was that subject to the weights, who wins and who loses depends on who makes the bigger estimation error. Underestimation of the other party's motivation causes losses. Hence there are four ways to lose the active game: One can have no motive in which case the other party cannot underestimate it. One can have a motive so visible and obvious that the other party cannot underestimate it. One can assume the other party has no motive, in which case one's underestimate is maximized. And one can make bigger bets on one's research than the other trader would. A concluding observation was that if the expected return on the trade is very high, then the motive of the other party has probably been seriously underestimated.

10. Active Mismanagement

Albert S. Kyle, Associate Professor of Finance at the Fuqua School of Business, Duke University, described his presentation as an application of game theory. In particular, he compared the relationship of institutional investor and money manager to the relationship of principal and agent. The problem of the principal and agent relationship can be used to understand the problem of the investor and manager relationship. Two aspects of the problem are adverse selection and moral hazard. Of these two, the latter is the more significant, and is represented by hidden actions and hidden information. It turns out that the ideal game theory approach is not the same for the two.

Examples of actions of the investment manager that may be hidden from the institutional investor are excessive transactions costs, perhaps through inadvertence or perhaps with side payments to the manager, allocation of trades to favored parties, mispricing of illiquid assets purchased from associates, inappropriate

risks in the portfolio (for example, from writing options to enhance performance), and manipulation of prices that may leave the client with a loss or modify the track record. Where it is not practical to monitor the actions of the money manager adequately, the investor may protect itself in a number of ways. The manager may be tied to an index, and given little freedom to take hidden actions. The index must be observable, tradeable, and non-manipulable. The manager must be capable of backing a guarantee to provide credibility to a promise to equal the return on the index. The effectiveness of these precautions depends, however, on the manager not hiding information from the investor.

The most important hidden information is probably that having to do with risk in the portfolio. The best remedy here is generally a risk sharing device, but its effectiveness will depend on the absence of hidden actions. Generally, however, the investor must deal with the possibility of both hidden action and hidden information. In this case there is no "first best" solution and we must go to a "second best." This will take the form of a combination of restrictions on manager behavior and monitoring. Restrictions may include limits to turnover, a prohibition against self-trading, an insistence that all customers be treated the same, and perhaps a requirement that only liquid assets are to be traded. The important thing about monitoring is that reliance on the track record is simply not satisfactory. Careful observations of style are necessary and global or statistical review is more appropriate than looking for a single transgression of the rules. Frequently marking to market and comparison to benchmarks is called for and here Kyle observed that computer technology is very helpful.

He focused on option writing as a particularly significant hidden action. Option writing can involve a very high probability of improving performance to a small extent coupled with a very small probability of disastrous loss. The consequences of such a strategy are what we may have seen in Orange County and Barings Bank. Options ironically offer some of the best opportunities for reducing risk and, at the same time via hidden actions, the greatest source of intolerable risk.

Kyle went on to consider the ways in which four classes of financial institutions deal with the principal/agent problem. The strength of banks lies in their ability to monitor illiquid assets. The strength of securities firms lies in real time monitoring of their own employees, good use of incentive contracts, and skills with market valued assets. Hedge funds suffer from an extreme form of the principal/agent problem. Hidden information can be very important. Hence risk sharing is a very important protection for the investor. Institutional investors control very large pools of capital, have long-time horizons, and can bear relatively large losses.

11. Performance Fee Incentives - Perception Versus Reality

Robert Ferguson, Associate Professor, Fordham University, distributed a paper by himself and Dean Leistikow entitled "One-Period and Long-Run Fee Incentives." The incentives created for managers by one-period performance fees have been discussed in a number of articles. In general it turns out that managers maximize their fees by maximizing performance volatility which is not in the client's best interest. Ferguson's work added to the literature a methodology to be used to analyze long-run performance fee arrangements as well as single period arrangements. The most straightforward single-period performance fee rewards the manager on the basis of end-of-period performance. The performance that is rewarded, with respect to a benchmark, is defined as

$$1 + R_{pb} = V_p / V_b$$

where R_{pb} is the relative return, V_p is the portfolio's actual value at the end of the period, and V_b is the portfolio value if it had been invested in the benchmark portfolio. The fee itself is given by:

$$F_c = \text{Max} [0, f (R_{pb} - R_T)]$$

where R_T is a threshold level of performance, expressed as a relative return and f is the proportion of performance above the threshold level (the excess performance) paid as a

performance fee. As the expression suggests, the performance fee is a fraction f of a call option where the “underlying performance asset” $(1 + R_{pb})$ is log-normally distributed and the strike is $(1 + R_T)$. Not surprisingly, this fee structure can be termed a “call performance fee structure.”

The “Bull-spread performance fee” structure puts a cap on the performance fee. With the bull-spread, the manager is long a performance call with a strike price of $(1 + R_T)$ and short a performance call with a strike price of $(1 + R_C)$, where R_C is the cap. Finally, the flat fee provides some incentive to perform because the base for the next period is increased by positive performance.

Turning to long-run performance fees, Ferguson’s assumption was that the client would renew the one-period management contract so long as the manager’s most recent one-period performance exceeded a pre-specified minimum level, R_m . It turns out that the value to the manager of this long-run performance fee arrangement is a multiple of the value of the one-period arrangement. The multiple plays the role of a capitalization factor, and depends only on the riskless interest rate, the minimum performance required to renew the contract, and performance volatility.

The interesting question is what sort of incentives the various performance fees offer to managers, and the extent to which the incentives encourage behavior attractive or unattractive to clients. The most important consequence to the client is likely to be the extent to which the manager is encouraged to take on inappropriate volatility. It turns out that in most cases the value of the one-period performance fee depends on performance volatility and the obvious incentive to the manager is to strive for very high volatility. The incentives created by the multiple alone are more complicated. For “lenient” clients, those that set the minimum level R_m very low (generally ≤ 0), the incentive created by the multiple alone is to closet index and to maintain low volatility, generally unattractive consequences for investors who think they have hired an active manager. For demanding clients, those with relatively high values for R_m , the incentive is for the manager to maintain a performance volatility of

$\sqrt{2 \ln(1 + R_m)}$. The net incentive will be a combination of the incentive motivated by the one-period performance fee and that motivated by the multiple. In addition to R_m , the threshold level, R_T , is important in establishing the incentive.

Ferguson presented a number of graphs showing the interplay of the various parameters. For the long-run call performance fee, with a positive performance threshold, closet indexers earn nothing. With demanding clients the incentive is to maximize performance volatility. The same is true with lenient clients but with very lenient clients the incentive is to limit performance volatility.

For a negative performance threshold, closet indexers make money. Demanding clients again provide an incentive to maximize performance volatility. Lenient clients encourage closet indexing. Very lenient clients encourage limited performance volatility.

For the long-run bull-spread performance fee, where the performance threshold is positive, closet indexers earn nothing. Demanding clients encourage limited but typically excessive performance volatility, and lenient clients encourage limited performance volatility. Where the performance threshold is negative, closet indexers make money. Demanding clients encourage limited but typically excessive performance volatility, while lenient clients encourage closet indexing and very lenient clients encourage limited performance volatility.

With a long-run flat fee, closet indexers make money, demanding clients encourage limited but typically excessive performance volatility, neutral clients and lenient clients encourage closet indexing.

It appears that a one-period performance fee never motivates managers to provide reasonable performance volatility. Volatility is maximized by call performance fees, is typically too large with bull-spread performance fees, and is irrelevant for flat fees. Long-run performance fee incentives are very like those for one-period when the minimum performance required for contract renewal is non-negative. Performance volatility is maximized by call performance fees

and is made too large by bull-spread performance fees. For flat fees there is an extremely weak long-run incentive to closet index when the minimum return is zero. It appears that managers can be motivated to take on reasonable performance volatility only when they are assured of not being fired for poor performance. The paper concluded that "For all practical purposes, the performance fee structures analyzed here fail to provide either reasonable incentives to managers or reasonable termination conditions to informed clients."

12. Controlling Misfit Through the Use of Dynamic Completeness Funds

David E. Tierney, Managing Partner, Richards & Tierney, Inc., distributed a paper entitled "Controlling Misfit Through the Use of Dynamic Completeness Funds." His presentation was closely related to previous discussions in the course of the Seminar concerning "deadweight," and the problem of reconciling the actions of active managers with the overall asset allocation strategy of the investor.

He began by defining the "misfit" problem. The investor can be thought of as first establishing an asset category target (ACAT). The ACAT represents the set of feasible investment opportunities the investor believes best achieves its investment policy. It can be thought of as the single portfolio which the investor would hold if it had to have all of its assets in that portfolio and passively managed. Plan sponsors typically choose broad market indices for an ACAT. For example, the S&P 500. Next, the investor hires a number of active managers, chosen for their perceived skill as well as to achieve some diversification in investment style. There are different ways of identifying style, but for purposes of his presentation Tierney arrayed managers in two dimensions, one ranging from large to small capitalization size, and the other representing a range between growth and value. A graph of over 200 domestic equity managers showed relatively few in the small value quadrant, more in the large value quadrant, still more in the small growth quadrant, and many in the large growth quadrant. A second graph showed clearly that style matters, that indeed there is significant negative correlation between the

rolling three-month performances of value managers and those of growth managers.

Tierney's approach was to specify a manager's investment style by designing a custom asset-list benchmark portfolio to reflect that style. The benchmark, then, is a passive, investible representation of the manager's permanent investment characteristics. It can be thought of as the ideal "manager universe." The problem now is that the sum of the benchmarks of all of the managers will not generally equal the ACAT. Hence the contribution of active management, which is the difference between the performance that would have been achieved by the passive ACAT and the actual performance, is in part a function of the difference between the aggregate of the benchmarks and the ACAT, and in part a function of manager skill. Algebraically, the return on the investor's overall portfolio is given by:

$$\text{Portfolio Return} = \text{Passive ACAT Return} + (\text{Passive Benchmark Return} - \text{ACAT Return}) + \text{Active Return.}$$

It is the passive benchmark return minus the ACAT return that is the misfit return or "style bias." There is in fact a misfit portfolio. It is the difference between the holdings of the benchmark and the holdings of the ACAT. The misfit return is the return on this portfolio, and the variability of misfit return is the misfit risk. For the typical plan sponsor, Tierney reported, the misfit risk in aggregate is often greater than the active management risk. Misfit risk is unproductive and should be avoided. Tierney suggested a number of ways in which this might be accomplished.

Using the ACAT as the benchmark for all managers might seem to eliminate the problem but does not. Swapping the benchmark return for the ACAT return might seem to be another solution, but since the swap would almost certainly have to be arranged with a brokerage firm it would be prohibitively expensive. Another solution may appear to be allocating funds among the managers such that the aggregate benchmark is equivalent in its characteristics to the ACAT. This strategy may not only lead to allocations that are quite incommensurate with perceived manager skills, it may be impossible without the addition of further managers to widen the range of the benchmarks, even though the skills of those

managers are not seen as justifying their retention. Another possibility to reduce misfit risk is the use of an index fund, or, even better, to use a passive fund specifically designed to bridge the gap between the ACAT and the aggregate of the active manager benchmarks. Tierney discussed the reasons why even this alternative may be less than satisfactory.

Finally, what he proposed was the creation of a dynamic completeness fund (DCF). Such a fund will have a return equal to the passive ACAT return minus the passive benchmark return, exactly offsetting the misfit return. The ideal DCF is a hedge portfolio, with long and short positions exactly offsetting. As a practical matter short positions may be unacceptable to the investor, and a positive-weight DCF is designed with only long positions to mimic so far as possible the performance of the long-short DCF.

Tierney presented the results of a case study. From June, 1983 through June, 1988 the plan sponsor experienced a misfit return of -1.69% and an active value-added return of 0.99%. Since the net of these two returns was negative, active management had actually impaired the overall performance. In 1988 the plan sponsor implemented a DCF. From June, 1988 through December, 1993, the misfit return was +0.44% and the value added by the managers was 1.15%. The positive misfit return was actually unintended; the object was to reduce misfit risk and this was in fact achieved, as one of Tierney's graphs illustrated.

13. The Derivative Portfolio Matrix — Combining Market Direction With Market Volatility

Eric H. Sorenson, Managing Director, Salomon Brothers Inc., had constructed most of his presentation around the phenomenon of the relationship between movement in rate of return and movement in return volatility of the stock market. The significance of derivatives lies in their use to exploit expectations with respect to changes in return and volatility. As far back as 1976, Fischer Black had observed an inverse relation between return and volatility. That is, as the volatility in return on an asset increased, the price of the asset tended to fall. And vice

versa. No causal relationship seems to have been discovered, only the fact of simultaneous changes. Sorenson observed that the value of the relationship for practical purposes rests on volatility being easier to forecast than price movement.

Practical applications, making use of put and call options, as well as futures, could be expressed in a matrix with price forecasts on one axis and volatility forecasts on the other. For example, if the S&P 500 Index is expected to rise, then for a forecast of lower volatility in the Index one sells a put, for a forecast of no change in the volatility one buys futures, and for a forecast of rising Index volatility one buys a call. A graph of the S&P 500 futures price versus the volatility implied by option prices, confirmed the negative correlation between movement in the price and movement in volatility. For the months from 1983 through 1995, those in the top quintile of volatility increase had a 50% probability of being in the bottom quintile of rate of return. Daily data for March, 1990 through November, 1994 indicated the odds were 2:1 that if one of price or volatility was rising, the other was falling. Sorenson presented a number of conditional market direction probabilities for the S&P 500 Index, given changes in volatility.

It turns out that the relationship is very similar for the stock markets in the United Kingdom and in Japan. It also turns out that the relationship exists for a number of industries.

Focusing on investment strategies, Sorenson discussed forecasting conditional returns, to make shifts in global asset allocation or to effect industry rotation. The strategies depend, of course, on a forecast of volatility and Sorenson reported on the results of using a GARCH model for this forecast. He presented a table of quantitative relationships between the expected return and the expected change in volatility.

He concluded with a discussion of Salomon Brothers Dynawrite model and illustrated its use for a DAX call option writing decision tree. Four factors are used: the last month DAX return, the last month DAX volatility change, the last week DAX volatility change, and the volatility change forecast derived from a GARCH index forecast tool.



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