Presenting the "All Stars" of Investment Strategies

1. Market Equilibrium in a Non-CAPM World

Harry M. Markowitz, Nobel Laureate, Fellow of the Institute and President, Harry Markowitz Company, made available his 2005 paper titled "Market Efficiency: A Theoretical Distinction and So What?" and his 2004 paper, co-authored with Bruce I. Jacobs and Kenneth N. Levy titled "Financial Market Simulation in the 21st Century" and published in the *Journal of Portfolio Management*.

The CAPM is an elegant theory. With the aid of some simplifying assumptions, it reaches dramatic conclusions about practical matters. In a CAPM world the market as a whole is the single best investment, and forecasting expected returns requires only forecasts of betas. The model rests, however, on some simplifying assumptions of which one is clearly unrealistic. In his presentation, Markowitz accepted three of the assumptions as reasonable approximations of reality. These are:

- Transaction costs and other illiquidities can be ignored,
- All investors hold mean-variance efficient portfolios,
- All investors hold the same (correct) beliefs about means, variances, and covariances of securities.

A fourth assumption, however, is unrealistic for almost all investors. This is that every investor can lend all she or he has or can borrow all she or he wants at the risk-free rate. A somewhat weaker, but also unrealistic assumption is that investors can sell short without limit and use the proceeds of the sale to buy long positions. In the absence of these two more or less equivalent assumptions, the market portfolio is not a mean-variance efficient portfolio, and in equilibrium the expected return for each security does not depend only on its beta. The purpose of Markowitz's presentation was to discuss the consequences of abandoning the fourth assumption.

He used as an example a market consisting of three securities, and demonstrated graphically that the mean-variance efficient straight line plotted for various combinations of the assets turned into two straight lines, with the market portfolio falling on neither of these lines.

He next raised the question whether if just one investor could sell short, would this investor arbitrage away the inefficiency in the market portfolio. Again, he showed graphically that not only would the market portfolio remain inefficient, but shorting the market would be a mistake. He considered the consequences of limited borrowing to show that once again the market portfolio is not mean-variance efficient.

Next, we generalize to a world that contains many securities. We begin with the portfolio that is 100% invested in the security with the highest expected return. We then trace out the set of efficient portfolios in a series of iterations, each iteration computing one piece (one linear segment) of the piecewise linear efficient set. Each successive

segment has either one more or one less security than the preceding segment. If the universe consists of say 10,000 securities, and if all securities are to be demanded by someone, then the universal efficient frontier must contain at least 10,000 segments. If investors have sufficiently diverse risk tolerances, they will choose portfolios on different segments. The market portfolio is a weighted average of individual portfolios and typically it is not on any efficient segment.

Turning from the negative consequences of a non-CAPM world, Markowitz suggested some positives. He described the JLMSim simulation model. This asynchronous simulator was developed to help think through the dynamic consequences of models more complex than the CAPM.

- All investors in current JLMSim seek mean-variance efficiency. For a particular simulation run, the JLMSim user specifies a series of parameters, including: how many securities, how many "investor templates", for each template how frequently to reoptimize, how to set bid and ask prices, how to modify bids and offers, or cancel orders, what *k* used in maximizing *E-kv*, how many statisticians, and what rules they use to estimate means, variances and covariances. (The statistician estimates expected return by increasing estimates for securities under target weights and decreasing them for securities over target weights.)

- The system converges fairly rapidly, as Markowitz showed graphically.

In concluding, he said:

If investors cannot borrow all they want at the risk free rate or short without limit and use the proceeds to buy long positions

Then

The market portfolio is not necessarily efficient,

Expected returns are not a linear function of betas,

There is no representative investor.

But

One can calculate equilibrium expected returns.

2. Equilibrium Simulation

William F. Sharpe, Nobel Laureate, Fellow of the Institute, STANCO 25 Professor of Finance, Emeritus, Stanford University, Chairman, Financial Engines, Inc. presented a second simulation approach. In answer to the question: Why analyze equilibrium? Sharpe proposed:

- An investor needs to have a *view* of the ways in which asset prices are determined.
- Risk and return forecasts should reflect these views.
- Asset prices are set by *investors* operating in *markets*.
- *Equilibrium prices* are those at which no investors are willing to make further trades.
- Asset prices will tend towards equilibrium until conditions change.
- Good *asset pricing theory* is a key

ingredient for good *investment practice*.

He commented briefly on two asset pricing theories: Mean/Variance and State Preference. His focus was on State Preference analysis. Which goes something like this:

- There are alternative future *states* of the world.
- One and only one will occur.
- For each state there is a *probability*.
- It is possible to buy and sell *state claims*
  A claim for state *s* pays $1 if and only if state *s* occurs (similar to an insurance policy).
- The markets are *complete*
  (every state claim can be traded).
- When equilibrium is established, there will be a set of *state prices*, one for each state of the world.

Sharpe introduced the Price Per Chance.

$$PPC = \frac{\text{State Price}}{\text{Probability of State}}$$

We can think of buying a state as equivalent to buying insurance. With any insurance policy, one should compare the price with the likelihood of cashing in on a claim. The higher the PPC, the less attractive is an investment. The incentive then is to allocate current wealth to obtain more future wealth in states with lower PPCs. The market wealth in a state is the sum of the individuals' levels of wealth in that state. If each individual wants more wealth in state A than in state B, the total desired market wealth in state A will be greater than that in state B.

He turned next to conditions for equilibrium. Given the amount of production, the amount of market wealth in each state is given. So prices must adjust until the individuals' collective demand for wealth in a state equals that wealth available. This implies that states with the same wealth will have the same PPC, and states with more wealth will have lower PPCs. For each PPC there is a level of individual wealth. Lower PPCs lead to higher levels of individual wealth. Thus each individual should arrange to have wealth that is related directly to market wealth.

Moving to a description of equilibrium simulation, he noted that the key question to be addressed is to what extent do the implications of the CAPM and/or State Preference Asset Pricing Theory hold when markets are incomplete and investors (1) Do not have mean/variance preferences, (2) Make different predictions and (3) Act in accordance with findings of behavioral research.

The vehicle to be used is APSIM, that is Asset Price and Portfolio Choice Simulator. (The APSIM simulator, with cases and manual, is available free of charge on Sharpe's website WWW.wsharpe.com.) The simulator produces discrete outcomes over discrete time. It simulates trading to reach market equilibrium and analyzes the characteristics of the resulting

equilibrium. For an investor we need to know his or her initial position, that is holdings. Next we need to know the investor's preferences generally in terms of above what price will the investor sell and below what price will the investor buy. We need the investor's predictions as well. Given these initial conditions, a market operates until no further trades are possible. Trades take place on the basis of the initial conditions, including preferences, and the trader's ability to take care of those preferences.

Sharpe went through a simple case involving two traders in a single commodity. He showed the inputs, the trading, and the equilibrium portfolios and prices that were reached.

A further case admitted outside positions. For example, the investors may have salary income beyond the income from their portfolios. He moved on to an example with a kinked marginal utility function. In this case the utility of avoiding losses was greater than the utility of achieving gains, a not unusual situation.

In concluding, his general observations were:

- The MRRT version of the Market Risk/Reward Theorem holds relatively well in most cases.

  Equivalently, asset prices are consistent with a pricing kernel that is a descreasing function of market return.

- The Market Risk/Reward Corollary fails in many cases.

  Investors do hold portfolios with non-market risk and in at least some cases they should do so.

Finally, he set out his requirements for good investment practice.

- A well thought-out view of the ways in which asset prices are determined:

  An *equilibrium model and/or simulation*.

- A procedure for making forecasts of possible future returns that take into account the *current market values of assets*.

  Such values reflect the opinions of investors worldwide concerning assets' future prospects.

- Without both ingredients it will be difficult or impossible even to know whether you are betting against the market and if so, in what manner.

3a. Flirting With Danger: Optimizing Leverage and Shorting

Ronald N. Kahn, Global Head of Advanced Equity Strategies, Barclays Global Investors, made available a paper, by himself, Seanna Johnson and Dean Petrich titled "Optimal Gearing." The authors establish a metric for efficiency, in the form of the transfer coefficient (TC). The TC is the correlation between an actual portfolio and an ideal optimal portfolio. It can also be expressed as the ratio of the IR (information ratio) in the actual portfolio to the IR in the ideal portfolio. Turning to long-short

implementations, Kahn asked whether there is a single correct risk level at which to operate.

He presented a simple model. We have *N* stocks. The residual returns are uncorrelated, with identical volatilities, ω_0. The forecasts of alpha are: $\alpha_n = IC \cdot \omega_0 \cdot z_n$ where *z* is a normally distributed random variable with mean = 0 and standard deviation = 1. We build the optimal portfolio *h*, with risk = ω^* (ω^* is the target risk). Then we estimate portfolio gearing *G*:

$$G = \left(\frac{1}{2}\right) \sum_{n=1}^{N} |h_{PA}(n)|,$$

where $h_{PA}(n)$ is the active holding for stock n. For long-short portfolios with cash benchmarks, the active holding equals the total holding. By this definition, a long-short fund 100% long, 100% short, and with 100% collateral, has *G=1*.

We consider various possible long-short portfolios with a gearing of 1. The optimal risk level, based on residual risk and number of stocks, is: $\omega^* = G \cdot \sqrt{2\pi} \cdot \left(\frac{\omega_0}{\sqrt{N}}\right)$.
So, for example, optimal risk is lower in Japan or the US than in Hong Kong, which has fewer stocks and typically higher levels of stock residual risk.

Kahn offered a graph plotting the TC against risk. With the gearing fixed, there is one particular risk level that maximizes the transfer coefficient. In other words, there is an optimal level of risk. Furthermore, operating above that optimal level can be worse than operating below it: the TC is not symmetric around that optimal risk. It is also true that given a fixed risk level, there is an optimal gearing. So managers must choose gearing and risk in concert.

Turning to shorting, we know that the long-only constraint significantly lowers the transfer coefficient. Allowing some shorting in previously long-only portfolios has to help. The question is, how much?

Kahn presented the results of simulation analyses of partial short (e.g. 120/20 or 180/80) portfolios. The simulations are used to build optimal portfolios of different target risk levels and different levels of allowed shorting.

As active risk increases, the desired amount of shorting increases. Partial short portfolios can achieve TC=1 up until a critical risk level, beyond which the desired amount of shorting exceeds the partial limit. Implementing equality constraints (e.g. requiring exactly 30% shorting) is optimal only at exactly the right risk level. In the example analysis, 30% shorting is optimal at about 1.3% active risk. It would be sub-optimal to require 30% short at 0.20% active risk or at 10% active risk.

Finally, partial short implementations require less shorting than equivalent risk long-short implementations, because partial short portfolios can implement negative views by underweighting stocks before needing to actually short the stocks. Because of this, as the costs of shorting increase, we may prefer partial short to long-short portfolios,

although under most conditions it appeared that the long-short was superior.

In setting out his conclusions, Kahn referred to two surprises. The first is that long-short is only optimal at the right level of risk, given fixed gearing; or at the right level of gearing, given fixed risk. The second surprise is that partial short portfolios can be more efficient than fully long-short depending on risk levels, costs, and the specific benchmark.

The three lessons he identified from his work were: (1) Constraints and costs matter, (2) It is important to understand them in detail, and finally (3) We continue to learn.

3b. Attribution: A Unified, Portfolio Based Approach

Richard Grinold, Barclays Global Investors, followed Kahn with a discussion of attribution. Grinold's approach was to put the analysis of ex-ante alpha, ex-ante risk and ex-post returns in the same framework. Ex-ante we start with a vector of alphas, a. An ideal implementation, call it Q, is selected so that the covariance of every asset with portfolio Q is proportional to its alpha. The information ratio of portfolio Q is the ratio of its alpha to its risk, $IR_Q = a_Q / w_Q$, and can be considered as an ex-ante estimate of our ability to add value. The portfolio we actually hold is P which, due to costs or constraints, is not equal to Q. A key equation is: $a_P = IR_Q \cdot \rho_{Q,P} \cdot w_P$ where a_P is the alpha of our portfolio P, IR_Q is the information ratio, $\rho_{Q,P}$ is the correlation between P and Q, also known as the **transfer coefficient** and w_P is the risk of portfolio P. In other words, the alpha of the portfolio P depends upon our potential as captured by the information ratio, how close the portfolio comes to exploiting those opportunities captured by the transfer coefficient and the aggressiveness of the portfolio.

The ex-post analysis of returns flows in an analogous manner. Given returns q we can ask what portfolio would have been the most efficient to hold if we had been fortunate enough to use q as our alpha forecast. This portfolio, call it Z, is selected so that the covariance of every asset with portfolio Z is proportional to the return on that asset. We call the ratio of the return on portfolio Z divided by the risk of portfolio Z the opportunity set; $OS_Z = q_Z / w_Z$. Portfolio Z plays an ex-post role that is analogous to the ex-ante role played by portfolio Q. This allows us to write the return on our portfolio P as

$$q_P = OS_Z \cdot \rho_{Z,P} \cdot w_P$$

where $\rho_{Z,P}$ is the correlation of portfolio Z with our portfolio P, we call this the realized information coefficient, and as before, w_P is the risk of the portfolio. These results are summarized as

$$a_P = IR_Q \cdot \rho_{Q,P} \cdot w_P$$
$$q_P = OS_Z \cdot \rho_{Z,P} \cdot w_P$$

In the first equation we consider what we expect to happen and in the second what actually took place.

The next step is to probe deeper into the correlations $\rho_{Q,P}$ and $\rho_{Z,P}$. We start with a set of information

sources. An example might be valuation, earnings quality, and market sentiment. Then think of building a series of portfolios, the first using only the valuation, the second using only earnings quality and the third using only market sentiment. We then have three mean-variance optimized portfolios that we will call the source portfolios. The correlation between the source portfolios *i* and *j* is $\rho_{i,j}$ and the correlation of the source portfolio *j* with portfolios *P*, *Q* and *Z* are $\rho_{P,j}, \rho_{Q,j}, \rho_{Z,j}$ respectively.

Next we calculate exposures (this step is equivalent to a linear regression) of our portfolio *P* to the sources by solving the equations

$$\rho_{P,i} = \sum_{Sources\ j} \rho_{i,j} \cdot y_{j,P}$$

for the ***exposures***, $y_{j,P}$. This calculation also yields a residual exposure equal to $\sqrt{1 - R^2}$ where R^2 is the r-squared of the regression. These exposures allow us to attribute the correlations $\rho_{Q,P}$ and $\rho_{Z,P}$ to the sources and the residual. In addition, we can use the same setup to attribute the correlation of our portfolio *P* with itself, $\rho_{P,P} = 1$, to get an attribution of risk to the sources.

This results in three equations:

$$\rho_{Q,P} = \sum_{Sources+Residual} \rho_{Q,j} \cdot y_{j,P}$$

$$\rho_{Z,P} = \sum_{Sources+Residual} \rho_{Z,j} \cdot y_{j,P}$$

$$\rho_{P,P} = \sum_{Sources+Residual} \rho_{P,j} \cdot y_{j,P}$$

The first of these attributes the transfer coefficient to the sources. The second attributes the realized information coefficient to the sources and the third attributes the portfolio risk to the sources.

In summarizing, Grinold said: model the elements of your investment management operation, alpha and returns, as portfolios and similarly capture your sources of information as portfolios. The relations among these portfolios are then in terms of covariance and correlation. This structure allows you to attribute correlations to sources and explain the transfer coefficient and portfolio return by how much each source is contributing.

4. Capital Allocation

Stewart C. Myers, Gordon Y. Billard Professor of Finance, MIT Sloan School of Management, made available by himself and Li Jin an article entitled "R^2 Around the World: New Theory and New Tests." The R^2 referred to is the statistic associated with a regression of the returns on a firm on the returns on an index. A high R^2 therefore indicates high statistical significance to the beta coefficient. Put another way, a high R^2 indicates a high degree of market risk relative to idiosyncratic risk.

Opaqueness (inadequate disclosure) is an obvious source of a high R^2. It is also to be expected that protection of investor property rights would mean less reliance on market risk by those investors, and in fact the R^2 is lower in developed countries where property rights are well protected. There is some question then as to whether the level of the R^2 is dependent on

opaqueness or on protection of investors or both. An important part of the research was distinguishing between the two effects. It turns out that it is opaqueness rather than poor protection of investors that generates high R^2s. Poor protection without opaqueness is not enough to explain the high R^2.

The assumption is that insiders will take as much of the cash flow of the firm as they are able to, subject to the ability and incentive for investors to take some action against them.

The more opaque the firm, the greater the amount of hidden firm-specific news that may arrive in a given span of time. The investors simply know little about what is going on within that firm and are poorly equipped to arrive at a sense of idiosyncratic risk. Therefore, they are forced to rely more heavily on market risk than would be the case when the firm is transparent.

While opaqueness is good news for the insiders because they can capture more cash flow when the firm-specific news is good, it is also bad news for insiders because they will capture less cash flow when the firm-specific news is bad, since they must absorb a larger portion of the loss in order not to alarm the investors unnecessarily. The amount of bad news that insiders are willing to absorb is limited, however. Insiders have an abandonment put. They can abandon the firm to investors or incur a cost to convey bad news credibly to investors. The exercise of the put releases cumulative bad news all at once and there is a crash. A crash is identified as a large negative outlier in firm-specific return. Increased opaqueness leads to a high frequency of crashes.

The theory predicts that other things equal, R^2 should be higher in countries where firms are more opaque, and crashes should be more common for firms in opaque countries.

Five proxies for opaqueness were developed. One was a measure of disclosure, one was the number of auditors per $1 billion of stock market capitalization, one was a measure of inclusion of accounting items in financial statements, one was a measure developed by others, and the fifth was a measure of the dispersion of analysts' earnings forecasts.

In concept, the model is one in which insiders will take as much cash as possible out of the firm up to the point where further capture will jeopardize their right to manage the firm. Outsiders may decide to take over, in a costly collective action. The net benefit will be less than the intrinsic value of the firm. The greater investor protection conditions, the closer the benefit will be to the intrinsic value.

Measuring R^2 involves fitting the market model for each stock in each year. The model is:

$$r_{it} = \alpha_i + \beta_{1i} r_{mt} + \beta_{2i} r_{us,t} + error$$

Weekly data are used and a correction for non-synchronous trading involves two leads and lags for r_m and r_{us}. R^2s are averaged within each country and year, using equal weights or variance weights. Two methods are used to determine crash frequency. COUNT is the

number of residual returns exceeding *k* standard deviations above and below the mean. COLLAR means determining the profit or loss from buying a deep out-of-the-money put on the residual return and selling an out-of-the-money call on the residual return.

It turned out that over the period 1990-2002 there was a fairly steady decline in the values of R^2 for the thirty countries for which data were available. It also turned out that crash frequency predicts R^2. High crash frequency by both measures predicted high R^2 with high statistical significance.

Moving to how well the proxies explained R^2 and crash frequency, Myers was able to show from regression analysis that the coefficients on the proxies all had the correct sign and that the t-statistics were satisfactory.

In conclusion, opaqueness, not investor protection, determines the R^2. And opaqueness is correlated with more crashes.

5. Sinking Globalization: What Could Go Wrong?

Niall Ferguson, Laurence A. Tisch Professor of History, Harvard University, suggested that the participants of the seminar might learn a lot from historical events so far enough back in time that they preceded the working lives of those participants.

He began by observing that the forty-year history of the Q-Group® will approximate the years of work experience for a number of participants and he went on to discuss the importance of that work experience in shaping expectations. Some anecdotes about important historical individuals in the history of finance illustrated how important even a single event may be to the way in which such a person conducts the rest of his or her professional life. We are vulnerable then to personal experience and especially vulnerable if we limit our knowledge to that experience.

He turned to the specific topic of his presentation, which was globalization. We may think of globalization, and the opposition and threats that it has created, as a new phenomenon. But Ferguson pointed out that globalization was characteristic of a large part of the world economy from 1880 to the start of the First World War. During that period free trade was the rule, capitalism was dominant, international capital flows were significant, and there was significant migration of workers. It is true that exchange rates were largely fixed and established by a gold standard, but there was also deflation and then inflation. Short interest rates were quite volatile, although long rates were stable. The introduction of savings banks had brought short-term interest rates quite low by 1910. Then what happened in 1914?

World War I came as a huge surprise to the investment community. Liquidity disappeared in a matter of days. Stock markets around the world closed down. What went wrong?

Globalization itself had something to do with the causes of the war. Globalization generated a

cultural and political backlash. There was a strong element of populism here. And Ferguson referred to a failure of the British hegemony. The beginning of the war featured strong anti-Western feelings, the rise of Bolshevism, terrorist attacks, and great power rivalry. It all has a somewhat familiar sound. He posed the question: Can we learn in time to avoid repeating the catastrophe of 1914?

6. On the Implications of Modern Risk Management for Equity and Credit Analysis

Robert C. Merton, Nobel Laureate, Fellow of the Institute and Professor, Harvard Business School described his talk as exploring the implications of modern enterprise risk management for external equity and credit analysts in evaluating the intrinsic values and risk profiles of firms. Inadequate analytical tools and over-reliance on accounting and actuarial conventions has caused systematic distortions of estimates of economic risk and value for firms.

He began with a discussion of pension funding surplus/deficits pre-FAS 87. Before 1987, the actuarial discount rate used to determine the PV of pension liabilities was a matter of judgment and was generally "backward-looking" and sluggish in changes through time. The liability measure would therefore deviate substantially from market rates.

In a rising and high interest rate environment, as in the 1970s – 1981, the discount rate would be lower than the market rate and the PV of liabilities would be overstated. But in a declining interest rate environment, as 1981 – 1986, the discount rate would be higher and the PV of liabilities understated. He referred to a discussion of this serious distortion in a paper by Martin Leibowitz.

He turned next to the effects of ignoring the cost of employee stock options prior to FAS 123 in 2004. Corporate profits and perhaps more important, operating efficiencies, in certain sectors were greatly overstated and innovation in incentive and retention compensation designs were inhibited.

Moving to a current problem, he discussed the failure to recognize the value and risk of corporate pension plans in distorting measures of systematic risk and cost of capital estimates for the entire firm. First, pension assets and pension liabilities should be included in statements of total firm assets and liabilities. And their effect on the beta and the cost of capital of the firm should be taken into account. He offered an example showing the difference between the calculation of a beta and a weighted average cost of capital for operating assets that ignored retirement fund assets and liabilities with one that included them. The latter produced a beta of 0.49 and WACC of 7.52% while the former had indicated a beta of 1.05 and a WACC of 12.35%. The differences were rather dramatic.

He went on to discuss the tradeoff between pension asset allocation and the capital structure of the firm. As the fraction of pension assets invested in equities is

increased, in order to maintain a fixed equity beta for the firm the equity capital must be increased and the debt to equity ratio decreased. In his example, with a fixed firm beta of 2.00, raising the fraction of pension assets in equities from 0 to 100 percent called for changing the firm's debt to equity ratio from 4.48 to 0.33.

Merton observed that large transformations in the risk of the firm can be implemented by the use of derivative securities without an impact on the earnings statement or the balance sheet. Examples were interest rate swaps, useful to banks to deal with the risk of borrowing short and lending long; equity swaps, used for reducing risks in pension funds assets; and credit default swaps, used for reducing risk in extensions of credit to customers.

He concluded by pointing out that the use of credit default swaps is part of a convergence of credit and equity analysis. The benefit to the credit of the firm is obvious, and the benefit to the equity investor is reduction or elimination of tail risk.

7. A Speculator's Look at Risk Management

Myron S. Scholes, Nobel Laureate, Fellow of the Institute and Managing Partner, Oak Hill Platinum Partners, focused his presentation essentially on the provision of two kinds of financial services: liquidity and risk transfer. And he characterized the providers of those services as speculators. Much of his talk was concerned with the role of hedge funds as the speculators, and he made many references to his own hedge fund.

Keynes was the first to discuss the relationship between speculators and hedgers. His theory was that those seeking to avoid or reduce risk turn to hedging, and that speculators profit from providing hedgers with insurance. Scholes pointed that there are two ways to deal with risk: either establish enough equity or hedge. There are costs associated with each, and the question then is which is more efficient. Markets have developed to improve the superiority of hedging over equity, and the stock market has become less important for cushioning equity risks. Hedging essentially transfers risks to those best able to carry them. The problem then shifts to how the speculators handle risk. Banks, for example, have ways of dealing with risk of borrower nonpayment. They demand collateral, they use VAR to identify risks, but realize that VAR is incomplete. Most important, it does not deal with tail events. Dealing with tail risk is difficult.

Speculators must deal with the volatility of the prices of risk transfer and liquidity services. Events can change the demand for the services quite dramatically. As conditions change, the speculator has to be able to adapt, and the most successful are those that can adapt quickly. The two resources the speculator depends upon are human capital and financial capital. Scholes referred to the recent problems at AMARANTH as an example of the need for very fast action.

He discussed the definition of the price of liquidity. The classic definition is the price of immediacy. He offered a definition as the cost of a put option to protect a position. This is a form of dynamic protection.

The standard models for dealing with financial risk do not cope with rapid price changes in the provision of liquidity and risk transfer services. So the speculator needs new models, and the ability to make quick changes in them. Protection is needed when interest rate curves steepen, when spreads widen whether or not credit spreads do so, when volatility increases and when asset values fall.

The separation of human capital from capital holders has become important. Scholes observed that in the past those with capital, like banks, have tended to hire the human capital to deal with the provision of risk reducing services, while more recently teams of risk analysts have turned to hiring the capital. And this might be a description of a hedge fund.

With more uncertainty, the value of human capital increases. The risk reducing team becomes more valuable as the environment becomes more chaotic. It is difficult to build and maintain those teams. There are some "natural" providers of risk services, among them are hedge funds.

Scholes described the "free boundary problem." A hedge fund can make an investment with a time period in mind, but that time period may shorten or lengthen with very little notice. It is important to be able to anticipate these changes and respond quickly. His fund has a model for each position it takes. The model has to anticipate how to decide when to get in and out of the position. But the model is only a guide, and more judgment is needed to deviate from it.

He went into more detail on risk control. Three major elements are a capital allocation model, an optimization model with a level of risk, and a plan for dealing with crisis. The optimizer makes use of the fund's own utility function, and the crisis planning makes use of scenario analysis. It is important to keep in mind that liquidity and risk transfer services is a time series business, dealing with period-to-period changes, something quite different from traditional financial analysis. A correlation structure is constantly changing, and an important part of the business is dealing with shocks.

8. Capital Ideas: Out of This World Or In The Thick of It?

Peter L. Bernstein, President, Peter L. Bernstein, Inc., answered his question in a presentation derived largely from a forthcoming book. He began by paying tribute to a dozen names that have revolutionized the world of finance and investing. These are Markowitz, Tobin, Sharpe, Treynor, Samuelson, Fama, Modigliani and Miller, Black-Scholes and Merton. And he linked the names in a progression of innovations by which each person on the list tended to provoke another into further innovation. In addition to tracking theoretical developments in the past years, he also discussed the practical application making these capital ideas useful. The names Wells Fargo Bank, Barr Rosenberg, Andrew Rudd, and Hayne Leyland came up as important in finding practical applications. Bernstein observed that risk management was at the heart of these significant

applications. Further, risk management has always been at the heart of the theory of finance. Capitalism is a gigantic form of game theory in which none of us can arrive at a decision without considering the responses of other players. All the variation, all the volatility, all the surprises are the outcome of human decisions. Communication is a critical element in the game. The more rapid and sophisticated the system of communication becomes, the more intense the game becomes .

Bernstein could not find any new theory today to compare in importance with those he explored over fifteen years ago. On the other hand, practical applications derived from these theories are everywhere, from sophisticated applications of mean/variance to techniques designed to separate beta risks from alpha risks – to say nothing of the bewildering complexity of new products in the derivative markets and the dominance of those markets over many aspects of investment decision making. Capital ideas are being reshaped by researchers and practitioners through an intricate combination of advanced technology and an endlessly varying institutional environment.

Why do we have the institutions we have and why do we organize as we have organized? Bob Merton's central argument, derived from sociological analysis, is that institutions are endogenous—developed within the system in response to needs, to anomalies and to dysfunctional aberrations.

Bernstein refers to a particularly odd paradox between theoretical concepts and real world practice. Repeated empirical tests of the original Sharpe-Teynor-Lintner-Mossin CAPM dating all the back to the 1960s, have failed to demonstrate that the theoretical model works in practice. Yet startling insights gained from CAPM still have great significance. Alpha management is one of the legacies.

The important theories generally assumed investor rationality. Yet few have argued that all investors actually behave rationally. Bernstein quotes Alfred Marshall, the great Victorian economist, who opened his Principles of Economics with these words "Economics…examines that part of individual and social action which is most closely connected with the attainment and with the use of the material requisites of wellbeing. Thus it is on the one side a study of wealth; and, on the other, and more important side, a part of the study of man." Bernstein quotes Daniel Kahneman as saying "The failure in the rational [i.e. Marshall's] model is…in the human brain it requires. Who could design a brain that could perform in the way this model mandates? Every single one of us would have to know and understand *everything*, completely, and at once."

With many vivid examples, Behavioral Finance has demonstrated that consistently correct decision-making under uncertainty is an impossible task. But Behavioral Finance has also made another significant contribution of great importance. Steve Ross sensed what Bernstein was referring to when he said "Neoclassical theory is a theory of sharks, not a theory of rational homo economicus." The scholars of

Behavioral Finance are providing a vital service for the rest of us and especially for the sharks.

Charles Darwin described how species adapt their biology as their environment shifts. Andew Lo finds a parallel process of evolution and change at work in the capital markets. He calls this notion the Adaptive Market Hypothesis. But evolution has a quality of inevitability–species will change and develop as a result of forces beyond their control. Unlike natural phenomena, the development of human institutions is contingent on the goals or purposes that motivated their establishment in the first place. Institutions are a result of trial and error where perfection is impossible but something less than perfect can often suffice. Institutions change as a result of purposeful decisions by the human beings who make use of them, but institutions also change in response to the forces of evolution.

With the passage of time Bernstein expects capital ideas to become increasingly involved in the capital markets and investment management, in new ways as yet unknown. The driving force for this process will come from institutional change, as Lo has hypothesized. Or, perhaps more aggressively, from Steve Ross' sharks. Yet, the theoretical innovations at the heart of all of the developments remain the most powerful part of the story. Innovation is always exciting, but influential innovations in theory in any field are rare. Theoretical innovations in finance did not even exist before 1952. The little group of a dozen men have left us a heritage whose value we cannot even begin to calibrate.

9. What's New and Old in Behavioral Economics And Finance?

Richard H. Thaler, Professor of Behavioral Science and Economics, University of Chicago, made available a paper entitled "The Loser's Curse: Overconfidence vs. Market Efficiency in the National Football League Draft" by himself and Cade Massey of the Yale University School of Management. He began his presentation by describing behavioral finance as a combination of better models of investor behavior and understanding of the limits to arbitrage. We can consider nonbehavioral finance to involve only rational agents, and efficient markets, meaning that the price always right and that there is no free lunch.

But does the evidence show that the price is right? Research on investor behavior indicates that individual investors are not very sophisticated. In the new defined contribution pension environment many are saving too little and investing unwisely. And even after the Enron collapse, many employees invest in their employer's stock.

Thaler described his concept of what he calls Libertarian Paternalism. As an example he described social security privatization in Sweden, launched in 2000 and similar to the proposal of President Bush in the United States. A 2.5% payroll tax goes to individual accounts that are self-directed. Participants were allowed to form their own portfolios by selecting up to five funds from an approved list of 456. One fund was chosen to be a

"default" fund for anyone who for whatever reason did not make a choice. Information about the funds, including fees, past performance, risk, etc., was provided to all participants. Funds (except for the default fund) set their own fees.

Some of the participant choices were particularly interesting. The average fee for the default fund was 0.16%, while that for the mean chosen fund was 0.77%. At the end of three years, the default fund had lost 29.9% and the mean chosen fund had lost 39.6%.

The largest market share (aside from the default fund) went to a fund that was invested primarily in technology and health care stocks in Sweden and elsewhere. Its performance over the five-year period leading up to the choice was 534.2 percent, the highest of the 456 funds in the pool. In the subsequent three years, it lost 69.5% of its value.

The lessons Thaler drew from the Swedish experience were that while economists often think that the biases observed in laboratories will be eradicated in open market settings, just the opposite can happen. Markets and advertising reinforced three individual biases: invest at home (for familiarity), chase returns (extrapolate history), and choose active management (reflecting overconfidence).

The second example Thaler presented had to do with the National Football League draft. He considered this to be a "real world" test. The description of how NFL teams pick college players is very lengthy. A brief summary follows. The draft is comprised of seven "rounds" and a round consists of each team picking a player once. Thirty-two teams draft 224 players. Selected players can only sign with the team that picks them. Picks are traded among teams and the question is whether the market for picks is rational and efficient. So how well do teams trade?

All of the teams rely on a draft pick value chart that was devised some years ago. It puts a value of each pick from #1 thru #32 for rounds 1 through 7 plus a round 8 that embraces all additional rounds (for a total of 256 picks). The most valuable is pick #1 in round 1. The least valuable is pick #32 in round 8. Thaler pointed out that there are serious errors, from a rational point of view, in the value chart. The early picks seem to be greatly overvalued relative to the later picks. For one thing, it turns out that the implied discount rate equating the values of the middle picks in two adjacent rounds is 174% per year. This seems irrationally high. Pick #1 is valued at pick #10 + pick #11, and also at picks #29 + #30 + #31 + #32. The equations do not fit the relative values of the picks as determined by Thaler.

For each player drafted we know when the player was drafted, how much he was paid in each year of performance, and a measure of the performances. The performance value minus the compensation paid can be considered a "surplus to the team" for that player. It turns out that the relationship between performance value and draft pick appears to be quite random. On average the surplus value rises from pick #1 through about pick #50 and

then declines. The best value seems to come more or less in the range of pick #25 to pick #75. Consistent with this picture, the value from pick #1 drops much faster than does the value from later picks.

In conclusion, Thaler found strong support for his overvaluation hypothesis. Open markets plus big stakes are not enough to eliminate decision making biases.

10. Will The Phillips Curve Cause World War III?

Jack L. Treynor, President, Treynor Capital Management, Inc. made available a paper entitled "Will the Phillips Curve Cause World War III?"

At the seminar in the Fall of 2002, Treynor had presented "A Theory of Inflation", later published in the *Journal of Investment Management*. At the current seminar he carried his theory forward. His paper began with a simple observation: In industry, labor and capital—workers and machines—are complements, not substitutes. Our textbooks are surely right that various proportions of land and farm labor can produce the same output. But in industry the proportions are fixed for each kind of machine.

How many workers does it take to man a rolling mill, an oil refinery, a fossil-fuel electric generating plant? Adding workers beyond the required number won't increase the output of such plants.

When a country's demand level fluctuates, workers and machines get more and less scarce together. The effects of the two scarcities on inflation are confounded. When, on the other hand, a country's labor force shrinks, causing labor to become more scarce, machines become less scarce.

The first point means that it is hard for central bankers to deduce from the history of demand fluctuations which scarcity is causing inflation. The second point means that when a county's labor force is shrinking, it's critical for its central bankers to know whether inflation is caused by a scarcity or workers or a scarcity of machines. If the former, it should tighten; if the latter, it should ease.

The experience of the US in the 1930s shows us the result of a failure to follow Treynor's advice. Based on the Consumer Price Index, the US inflation rate was negative from 1926 on. But judging from the rates on bankers' acceptances, the Fed made no adjustment in velocity, hence in its nominal rate. The result was real short interest rates averaging around 5% for four consecutive years. When demand finally collapsed, the CPI fell about 25% between 1929 and 1933 (Dornbusch and Fisher). The Fed completely lost control of the real rate, which was never less than 9% in that period. Today, no central bank would knowingly steer its economy into negative inflation rates.

The experience of Japan in the 1990s is also instructive. Japan was the first major country to have a shrinking labor force. As it shrank, machines became more plentiful. As the least efficient machines were retired, the labor productivity of the

marginal machine, hence the real wage, rose. With the money wage fixed by negotiation, money prices fell. Between 1990 and 2001, Japan's CPI inflation rate fell almost 400 basis points. Its central bankers went with the Phillips curve and expected inflation. Accordingly they raised their overnight rate 400 basis points. By the time they could reverse their policy, it was too late. The result was a classic liquidity trap, with negative inflation rates. Even though the central bankers retained control of the nominal overnight rate (which reflects the scarcity of money), they lost control of the real rate. Unless central bankers learn the proper lesson from the Japanese experience, they will make the same mistake when confronted with Japan's circumstance.

Turning to the matter of shrinking workforces in Europe, the Japanese experience suggests that when your labor force is shrinking you cannot rely on the Phillips curve. The problem today is European fertility rates, which are now far below the 2.1 rate necessary to maintain the current size of their populations. When the first of the small cohorts grow up and reach the workforce, it too will begin to shrink. Treynor showed that workforces in the major countries have already leveled off, and he raised the question will European central bankers repeat Japan's mistake?

A workforce begins to shrink when there are fewer young people entering the workforce than old people leaving. Perhaps a reasonable age to focus on is high-school graduation – the cohort aged 15 to 19. For the major European countries we can see that the drop in fertility rates has affected the people already in the workforce only slightly. But the drop is quite noticeable in the 15 or 16 year olds, and substantial in the younger cohorts. The timing seems to be different for different countries, as Treynor demonstrated. He noted that for Canada the first year of the lower fertility rate was 1990. The babies born in 1990 won't begin to reach the Canadian labor force until 2008.

Liquidity traps are aptly named, because they are hard to get out of. Central bankers can learn from Japan's experience, but how fast? Speed is more important for Europe than it was for Japan. Japan extricated itself by devaluing the yen against its important trading partners. But the major European countries won't be able to devalue against each other. And neither Japan nor the US can afford to oblige the Europeans by increasing the value of its currency – Japan because its inflation rates is already too low, and the US because its trade deficit is already too high.

Historians are in wide agreement that World War II was instrumental in restoring prosperity. At the end of the Depression decade one in seven workers remained unemployed. By war's end, unemployment was negligible.

Treynor concluded that if labor and capital are substitutes, then a scarcity of labor will also mean a scarcity of capital. But it they are complements, then a scarcity of one results in a surplus of the other. In particular, a shrinking workforce results in a surplus of machines.

Should the central banker ease or tighten? It is critical to know which scarcity is causing the inflation.

11. The Franchise Cycle

Martin L. Leibowitz, Managing Director, Morgan Stanley, made available a paper by himself and Anthony Bova entitled "P/E and Pension Fund Ratios."

The paper begins with the observation that there is some evidence for the intriguing conjecture that P/E ratios may decline under both significantly low and significantly high real interest rates. The P/E response pattern would then resemble a flat-top tent that angles downward at both ends The paper explores the risk implications of such a low rate scenario and the equity valuations that could give rise to such a tent pattern.

A number of historical studies of price/earnings (P/E) ratios for US stocks have exhibited generally declining P/Es as a function of higher nominal interest rates. A different perspective emerges when real rates are substituted for nominal rates. For 1978 to 2004, n place of the traditional picture of P/E declining with nominal rates, the highest P/Es for real rates lie within a "sweet spot" of 2-3% and then fall off for both higher and lower rate levels.

A possible explanation for the tent diagram is that in the 2-3% sweet spot, economic and profit growth might be reasonably normal. However, as growth and demand for funds push real rates beyond 3%, valuation begins to be impaired by the increasing cost of funds. Very low real rates could be associated with poor economic conditions and poor prospects for future growth. Leibowitz set up an example of a dollar pension fund and showed the pattern for the funding ratio. The funding ratio, which is 100% at a 3% real rate, does not vary much at rates above 3%, but falls significantly at rates below 3% The overall pattern for the funding ratio shows a surprisingly high degree of stability at higher interest rates, but a horrendous falling off at lower rates.

The standard present value models do not fit the tent pattern, so Leibowitz turned to a valuation approach referred to in previous papers as the "franchise value" model, in which equity valuation is separated into the tangible value, — the value associated with a firm's current book of business as articulated in a "perpetual-equivalent" stream of earnings that could be generated without further investment — and the franchise value, derived from the growth of productive investment opportunities available to the enterprise. The franchise value is approximated by the product of two basic factors, one characterizing the growth of the opportunities for investment, and a second factor representing the net present value generated from their average excess return. With the franchise value model, it is possible to generate regime-dependent parameter values that create the tent-like P/E pattern.

The franchise value approach subjects growth prospects to a rigorous discounting that dampens the value contribution at higher discount rates. P/Es turn down at

some point as higher rates overwhelm the associated higher growth prospects. At lower rates, the corresponding lower growth rates help to generate lower P/Es. The combination of these two effects at the extremes in interest rates is a key ingredient in creating theoretical P/Es having the tent shape.

The preceding discussion had been focused on the real rate liability of the defined benefit plan that is fully funded at the outset. Leibowitz next turned to the current transition from defined benefit plans to the defined contribution and IRA format. Defined contribution plans are really defined benefit plans in microcosm. In contrast to the DB format, an individual's DC plan does not have the benefits of aggregated mortality risk, investment and administrative efficiencies, a broad time span for discharge of liabilities, or the potential for contingent support from a backup sponsor. The DC plan also faces largely a real, rather than a nominal, liability.

DC plans also suffer from a special form of cognitive dissonance. Individuals are prone to poor retirement planning. Even at comparable levels of appropriately defined funded ratios, a DC plan may be more fragile than the corresponding DB analog.

The problems of the DC plan would become exacerbated by descent into a left-hand (low real interest rate) scenario. For one thing, unlike DB plans, an individual may not have the luxury of being able to "ride-out" a left-hand rate scenario, even one that turns out to last for only a short time period. Leibowitz also pointed out that it is well known that DB plans help smooth market movements by their strategy of short-term rebalancing. This contrasts with the more momentum-like responses of other market participants that tend to "pile-on" and thereby exacerbate market volatility. To the extent that DB plans move into structures that no longer call for automatic rebalancing, a major source of smoothing activity will be lost. If such a trend becomes widespread, it could eventually create a more volatile environment for risky investments. Together, DB and DC plans already form the largest cohort of long-term investment funds in the US market. To some extent these funds have objectives and concerns that could lead them to move in concert to lower risk strategies, all within a limited space of time. As such, they could become a potent factor affecting both the long-term reallocation of risky assets as well as the shorter term volatility response to fundamental events.

In concluding, Leibowitz observed that the key point of his paper is that the "left-hand scenario" evoked by the tent diagram may represent the ultimate "black hole" for investors subject to some form of long-term liability. Such an environment, especially if persistent over time, could lead to low growth prospects, reduce risk tolerance, a move to lower risk assets, increased risk premia, and adverse correlations across alternative asset classes. The good news, however, is that such events are rare and for the most part real interest rates and the associated market conditions tend to be localized within or near the sweet spot.