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SEMINAR REVIEW

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Sunday, October 14, 2012 through Wednesday, October 17, 2012

HEALTH, WEALTH AND MARKETS

“The Q-Group”®
THE INSTITUTE FOR QUANTITATIVE RESEARCH IN FINANCE®

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Seminar Review
Fall 2012: “Health, Wealth and Markets”

October 14-17, 2012
The St Regis, Monarch Beach, Dana Point, CA
During the 2012 Fall Meetings of the Q-Group at the St. Regis on Monarch Beach, there were many provocative sessions that contested old notions, investigated new challenges, and crafted innovative approaches to solve problems confronting society.

How high frequency trading (HFT) has changed equity markets was the subject of a two-session panel led by Larry Harris of University of Southern California. One of those presenting, Robert Litzenberger of RGM Capital Advisors, focused on the history of trading in equity markets and emphasized how changes in regulation and technology helped create an environment in which HFT developed. Jonathan Brogaard, University of Washington, explored the role HFT plays in the price discovery process and whether HFTs impact has been benign or not. In characterizing HFT, he said it is less like a traditional market structure and more like a highly competitive environment.

Harris concluded the HFT panel session with summary comments. He pointed out that one thing not being considered is the vulnerability of new electronic systems to terrorism. Much damage could be done to the markets by those who have access to the system. This, he said, should be of concern to Homeland Security especially at a time when it is the cost of accessing the system is relatively low. The potential damage that could be caused by unfettered terrorist access could be staggering.

The second panel session addressed the equity risk premium (ERP). Brett Hammond of MSCI moderated the session that included William Sharpe, Stanford University, Martin Leibowitz, Morgan Stanley, and Laurence Siegel of the Research Foundation of CFA Institute.

In his opening remarks, Hammond said that the ERP is the most important measure in all of finance. After several decades during which realized equity returns followed a “welcome positive pattern”, there has been a marked downturn in equities. An ERP forecast made a decade ago now seems too high. He said that the evidence leads some to conclude that future expectations for equity returns must be permanently adjusted downward. Others disagree saying that equities are poised for outstanding future excess returns.

As to the 2002 ERP estimate of 7% (Grinold and Kroner) Siegel said it was too high: the overestimate caused by unexpected changes in market sentiment. He pointed out that sentiment is captured in the re pricing term of the traditional dividend discount model and is captured by estimating change in levels of price/earnings ratio. After a decade of economic turmoil, Siegel said his estimate of the re pricing term is zero and his market premium forecast for the next decade is 4.3%.

Leibowitz took a different approach, focusing on the relationship between the ERP and interest rates. He created a series of hypothetical return models assuming rising rates. His models included drift in the default-free rate underpinning the equity risk premium. He cautioned that higher return expectations and premiums may be an indication of greater prospective risks and/or lower growth prospects, rather than bargain pricing.

Bill Sharpe focused on the expected risk premium itself and the model used to estimate it.
He described the capital asset pricing model (CAPM), with its assumption that only market risk is rewarded, as an incomplete model. He described a state-dependent model that he deems superior, and a measure that combines pricing with probability -- state price per chance.

Hammond closed the ERP panel discussion with the observation that the past 10 years of market history coupled with what these and other researchers have found shows that questions about the ERP are far from being settled.

Antti Ilmanen of AQR Capital Management also discussed the ERP, but his emphasis was on how to capture it. Over the past 30 years, he stated, we have shifted our beliefs from market efficiency to behavioral economics and finance. Over the same time period, equity returns have been lower and the use of equity premium-capture strategies has increased. Rather than using old strategies to capture the ERP, he proposed that managers use a multi-beta-oriented approach he called “wide harvesting.” He said this approach is the most realistic way to achieve 5% real returns in a low-return world. However, he cautioned, is an approach is available only for those willing to utilize what he called the “three dirty words in finance:” leverage, shorting, and derivatives.

Harrison Hong of Princeton University suggested we use a beta variation he calls “speculative beta.” Over the past 20 years, financial economists have developed a large and impressive body of findings on the predictability of excess returns. However, the behavior of the Security Market Line (SML) is idiosyncratic, and under certain conditions it initially increases and then decreases. In Hongs opinion, what drives this anomaly is the level of investor disagreement about the common factor in cash-flows: high-beta assets are more sensitive to disagreement about the macro-economy than are low-beta assets.

Kent Daniels of Columbia Business School spoke about “momentum crashes.” Momentum strategies, a bet that past returns predict future returns, have produced strongly positive alphas. There are two problems with these strategies: returns to momentum strategies are highly skewed; they sometimes result in a strong and persistent string of negative returns - momentum crashes. Daniels said that momentum crashes occur in times of market stress and when returns are high. He wondered if the changing beta of the momentum portfolio might be partly responsible for these crashes and if it might be used to forecast these crashes.

Ways to capture portfolio returns are of continuing interest to Q-Group members. Responding to research by Berk and Green, NYU colleagues Edwin J. Elton and Martin Gruber looked at the performance of the best performing funds asking whether after positive alpha performance their returns decline. They found a strong relationship between past and future alphas of mutual funds and that the best performing funds produced positive future alphas. They also reported that while growth in fund size erodes predictability, it does so slowly. They concluded that when money follows performance it is not necessarily naïve.

Motohiro Yogo (Federal Reserve Board Minneapolis), Andrew Lo and Jonathan Gruber (Massachusetts Institute of Technology) all discussed healthcare practice and policy. Yogo presented measures that allow for the standardization of health and longevity products, thus creating a kind of life-cycle fund approach to assessing and designing investment products. His approach identifies overlaps and gaps in existing products’. His approach is one that could be used to develop new products that combine life insurance with deferred annuities.

What more thought-provoking question could there be than that of Lo: “Can Finance Cure Cancer?” His idea is to apply financial engineering to the problem of financing early stage biomedical research – research currently ignored because of the poor risk-return profile of individual research projects. He proposed using a special purpose vehicle (SPV) to fund 150 early stage research initiatives. This fund would diversify risk while maintaining reasonable market return potential. He said that this could attract investors and provide funding that he hoped would lead to innovation and cures.
Jonathan Gruber had a major role in designing the Massachusetts Health Care Reform law, widely called Romneycare, and the U.S. Patient Protection and Affordable Care Act (PPACA) legislation called Obamacare. From his unique knowledge he recounted the history of how the both plans were developed and negotiated, and provided considerable detail about the features of them. Gruber discussed the Acts and their impact with clarity and insight.

In the category of thought provoking ideas from different disciplines, a recurring feature of the dinner speakers at Q-Group meetings, Joel Kotkin of Chapman University spoke about the risk declining population growth, what he called a “demographic winter.” The social impact of lower birth rates includes an aging population and a higher ratio of elderly to working age people. As potential solutions to the coming chill, Kotkin argued in favor of fostering immigration, lowering housing costs, and shared parenting using on the Scandinavian model.

For further information on each of these presentations see the full summaries of each session. For those wanting access to the papers and slides that accompanied each presentation, please go the Q-Group website at http://www.q-group.org/. An audio recording of each presentation is also available.
Health and Mortality Delta: Assessing the Welfare Cost of Household Insurance Choice

Presented by Motohiro Yogo
Federal Reserve Bank, Minneapolis

Retail financial advisors and insurance companies offer a wide variety of what Yogo called health and longevity products including such things as life insurance, annuities, supplementary health insurance, and long-term care insurance. His research attempted to address two questions related to the household insurance choice: (1) What is the optimal demand for health and longevity products and (2) how close is the observed demand to being optimal?

To choose among products and create an investor-appropriate optimal portfolio requires a way to measure risk. For equity and fixed-income investment products there are two widely used measures of risk -- beta and duration. No similar risk measures for assessing the risk of health and longevity products exist. To rectify this, Yogo developed two risk measures: the health delta and the mortality delta. The health delta measures the differential pay-off that a policy delivers when the insured is in poor health; the mortality delta measures what a policy delivers at death.

Three forces explain the optimal health and mortality deltas. There is relatively more wealth in the health states in which:

1. The marginal utility of consumption is high as determined by the relative weights ascribed to poor and good health;
2. The average propensity to consume is low; and
3. Lifetime disposable income is low.

Yogo said that an individual should combine health and longevity products to reflect the optimal health and mortality delta in their portfolio. The optimal exposure to the health and mortality deltas depends on the individual’s, and bequest motive) and personal characteristics preferences (e.g., risk aversion, consumption (e.g., birth cohort, age, health, and wealth). The objective function is shown in below.

\[
U_t(h_t) = \left\{ \begin{array}{l}
\omega(h_t)^\gamma C_t^{1-\gamma} \\
\text{present consumption} \\
+ \beta \left[ \pi_t(h_t, \text{Dead}) \omega(\text{Dead})^\gamma A_{t+1}(\text{Dead})^{1-\gamma} \right] \\
\text{bequest motive} \\
+ \sum_{j=(\text{Poor},\text{Good})} \pi_t(h_t, j) U_{t+1}(j)^{1-\gamma} \\
\text{future consumption} \end{array} \right\}^{1/(1-\gamma)}
\]

Yogo then reported on the health and mortality risk of a representative sample of U.S. men who were 51 and older. Those in the sample were interviewed every two years beginning in 1992. For each cohort the key inputs for the model were:

- Health transition probabilities
- Out-of-pocket health expenses (after employer-provided insurance and Medicare)
- Income including Social Security (excluding annuities and private pensions)
- Actuarially fair prices for health and longevity products

In addition he observed participants' ownership of:

- Term and whole life insurance
- Annuities including private pensions
- Supplementary health (Medigap) insurance
- Long-term care insurance

The following exhibit shows the out-of-pocket health expenses, income, and present value of
future disposable income, in constant dollars, for men born in 1936–1940. Income is then compared to out-of-pocket expenses and disposable income, dependent on state of health. Some of the numbers appear anomalous, for example, the lower negative present value of future disposable income for men over 91 in poor health. Yugo explained that this is due to the fact that the future income of individuals in poor health is truncated because they die sooner.

<table>
<thead>
<tr>
<th>Health</th>
<th>51</th>
<th>59</th>
<th>67</th>
<th>75</th>
<th>83</th>
<th>91</th>
<th>99</th>
</tr>
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<tbody>
<tr>
<td>Poor</td>
<td>2.0</td>
<td>4.5</td>
<td>7.6</td>
<td>12.5</td>
<td>21.4</td>
<td>37.9</td>
<td>69.5</td>
</tr>
<tr>
<td>Good</td>
<td>0.4</td>
<td>1.2</td>
<td>2.6</td>
<td>4.6</td>
<td>7.4</td>
<td>10.6</td>
<td>13.7</td>
</tr>
<tr>
<td>Mean</td>
<td>0.4</td>
<td>2.1</td>
<td>3.8</td>
<td>6.8</td>
<td>12.6</td>
<td>25.2</td>
<td>53.8</td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>Income (thousands of 2005 dollars per year)</th>
</tr>
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<tr>
<td>Mean</td>
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<tr>
<td>51</td>
</tr>
</tbody>
</table>

The following chart shows the optimal health and mortality delta over a life cycle.

Retail financial advisors and insurance companies should report the health and mortality deltas for their health and longevity products. This, Yogo hopes, will:

1. Facilitate standardization of products;
2. Identify overlap between existing products;
3. Identify risks that are not insured by existing products; and
4. Lead to the development of new products that are analogous to life-cycle (equity/fixed-income) funds consisting of:
   a. Packaged life insurance and deferred annuities.
   b. Products that automatically switch from positive to negative mortality delta around retirement age.

He gathers data about ownership of health and longevity products (the scatter in the following chart) and compares that to what he estimates as optimal, shown by the chart’s dark line.
The Equity Premium and Beyond

Presented by Antti Ilmanen
AQR Capital Management, LLC

The equity premium has always engendered discussion, but never more than now when markets and investors are so unsettled. In a presentation based largely on his 2012 book, Expected Returns on Major Asset Classes, Antti Ilmanen reviewed equity premium history and projections for its future.¹

Ilmanen expressed concern about how managers capture the equity premium using non-traditional assumptions about the source of risk premiums, particularly in the midst of unsettled markets. To provide context he said that historically equity returns have beaten the rate of inflation and the returns on bonds and bills in every country and over the long term: the long-run world equity premium is 4.4% over cash and 3.5% over bonds.

Ilmanen decomposed returns into real growth in corporate earnings and dividends, dividend yield, inflation, and gains from re pricing. Using the chart below he showed that the real growth of earnings per share (lowest line on right axis) and dividends (second lowest line on left axis) has lagged that of GDP (dotted line) and GDP per capita (second line from the top of right axis).

Ilmanen pointed out that over time the consensus assumptions regarding the risk premium in academic finance have changed. Thirty years ago we assumed the following:

1. A single risk factor (beta) affects the equity market.
2. Expected returns are constant over time.
3. Investors are concerned only with the mean and variance of returns.
4. Efficient markets are inhabited by rational investors.

Our present understanding of what creates premiums recognizes that:

1. Multiple risk factors affect the equity market.
2. Required returns should ultimately depend on co-variation with “bad times.”
3. Risk premiums are time varying.
4. Skewness, leverage, and liquidity preferences exist.
5. Investors’ irrationalities and market frictions can create market inefficiencies.

Times have certainly changed, and Ilmanen reminds us there are better ways to earn an equity premium: global diversification; constant volatility targeting; defensive equity, value and momentum tilting; and equity market timing based on value and momentum signals.

He said that there are two primary reasons why most institutions still choose to depend on an outmoded notion of the equity premium. First, equity risk dominates traditionally diversified portfolios, and, second, the market is highly directional, as he showed in the chart below. All this happens in a world where correlations have increased -- for many global equities portfolios

¹ Research Foundation of CFA Institute
the correlation can exceed 0.9. Note in the chart, the lines on the right axis are in order of the legend.

Illmanen said that the exposure of portfolios to the equity risk premium is even more apparent when portfolio allocations are measured by risk rather than by dollars.

Equity domination would be justified, Ilmanen said, if the equity premium offered a uniquely high Sharpe ratio. However, when it does not a better risk-balanced set of return sources would likely improve a portfolio’s risk-adjusted return. As a solution he recommended more aggressive diversification through risk parity investing and the use of alternative beta premiums. His prescription was to diversify more aggressively thus cost-effectively harvesting multiple return sources. This approach, he concluded, is the most realistic way to achieve 5% real returns in a low-return world, but it is available only to those who are willing to utilize what he calls the “three dirty words in finance”—leverage, shorting, and derivatives.

To achieve this level of returns, he said, others may have more faith in illiquid assets, discretionary manager magic or market timing. These are, in his estimation, approaches that should have a modest role in a portfolio. The core of the portfolio should be multi beta-oriented. He called this approach “wide harvesting” and that has the following possible results:

1. Global diversification may reduce portfolio volatility—especially at longer horizons—without sacrificing average returns, thereby improving risk-adjusted performance.

2. Long-run market volatility conceals shifting periods of low and high volatility. Thanks to volatility persistence, constant-volatility targeting may help keep portfolio risk more stable over time and result in slimmer tails for the distribution.

3. While most speculative assets within each asset class give disappointing long-run returns, levering up low-risk peers offers much better returns.

4. Earning the equity premium together with helpful stock selection tilts can improve a market-cap portfolio’s performance.

5. Earning the equity premium together with helpful market timing tilts can improve the performance of the buy-and-hold portfolio even though risk is concentrated.

Ilmanen provided graphic support for each of his conclusions.
High Frequency Trading and Price Discovery

Presented by Jonathan Brogaard
University of Washington

Brogaard said that financial markets have two functions important for asset pricing: liquidity and price discovery. Historically, financial markets relied on intermediaries to facilitate these functions. When stock exchanges became fully automated, the markets’ trading capacity increased and intermediaries were enabled to expand their use of technology. This reduced the need for human market makers and led to the rise of a new class of intermediaries, typically referred to as high frequency traders.

Many do not believe that high frequency trading (HFT) is benign. To demonstrate this Brogaard presented a sample of stories about HFT and its potential for harm that appeared during 2009 in The New York Times:

It's hard to imagine a better illustration (of social uselessness) than high-frequency trading. The stock market is supposed to allocate capital to its most productive uses, for example by helping companies with good ideas raise money. But it's hard to see how traders who place their orders one-thirtieth of a second faster than anyone else do anything to improve that social function.

Paul Krugman
August 2, 2009—New York Times

Brogaard acknowledged that these concerns are legitimate. However, he said, HFT is “socially useless” only if there is no new price discovery. To examine price discovery, Brogaard used a state-space model which incorporates the interrelated concepts of price discovery and price efficiency. He used the model to decompose price movements into permanent and temporary components and to relate changes in both to HFT. The permanent price movement component is normally interpreted as information and the transitory component is seen as pricing errors (also referred to as transitory volatility or noise). He used a NASDAQ dataset that includes trading data on a stratified sample of stocks in 2008 and 2009 and provides information on whether the trade is a liquidity-demanding (HFTD) or liquidity-supplying (HFTS) trade.

Brogaard stated that he found the following impact on price discovery:

1. Overall, HFT trades make prices more efficient.
2. Results are stronger on high-volatility days.
3. Market order trading shows positive correlation with efficient price and negative correlation with pricing error/noise. This is consistent with forecasting both parts of returns.
4. Limit order trading coefficients have opposite signs: negative with efficient price and positive with pricing error/noise.
5. Efficient price is a consequence of standard adverse selection of liquidity providers.
6. Noise could be the result of adverse selection, manipulation, and/or order anticipation.

The most important issue at this point is whether these passive trades make money. The answer,
Brogaard said, is yes. They earn the spread and liquidity rebates, although the overall HFT profitability is quite low (around $0.03 per $10,000 traded.

Brogaard provided considerable analysis before presenting these conclusions:
1. Overall, HFT increases the efficiency of prices by trading in the direction of permanent price changes and in the opposite transitory pricing errors. This is done through marketable orders. In contrast, non-marketable HFTS (liquidity-supplying) orders are adversely selected on both the permanent and transitory component of prices.
2. HFT marketable orders’ informational advantage is sufficient to overcome the bid-ask spread and trading fees to generate positive trading revenues.
3. HFT predicts price changes occurring a few seconds in the future.
4. Brogaard said that there is no evidence that HFT contributes directly to market instability in prices. In fact, during a period of relative market turbulence from 2008 to 2009, overall HFTs traded in the direction of reducing transitory pricing errors, both on average days and on the most volatile days measured.
5. HFT imposes adverse selection costs on liquidity suppliers both overall and at times of market stress. This could lead, he said, to non-HFT liquidity suppliers withdrawing from the market and indirectly result in HFT reducing market stability.

Brogaard concluded that HFTs are a type of intermediary. When thinking about the role HFT plays in market it is natural to compare the new market structure to the previous one. There are some primary differences: there is free entry into HFT; HFT does not have a designated role with special privileges; HFT does not have special obligations.

When considering the optimal industrial organization of the intermediation sector, HFT more resembles a highly competitive environment than a traditional market structure. A central question, Brogaard said, is whether possible benefits from the old, more highly regulated intermediation sector outweigh the disadvantages of lower innovation and higher entry costs that are typically associated with regulation.
The Impacts of Automation and High Frequency Trading on Market Quality

Presented by Robert Litzenberger
RGM Capital Advisors

The U.S. equity markets have changed from predominantly manual markets with limited competition to highly automated and competitive markets. One method that has attracted the attention of the media and policy makers is high frequency trading (HFT). Studies using proprietary exchange provided data that distinguishes activity by HFT firms show they contributed directly to narrowing bid–ask spreads, increasing liquidity, and reducing transitory pricing errors and intra-day volatility.

To begin his analysis, Litzenberger discussed the structure of pre-electronic markets and the evolution of electronic trading. The idea of an electronic marketplace was articulated far earlier than the technology allowed. To emphasize this he pointed to a statement by Don Weeden, a “financial prophet,” who wrote the following to the SEC in 1969.

“With today’s electronic miracles available to the industry, all market makers wherever located could be combined into a central, interrelated market for fast and efficient access by investors to all its segments. The true central marketplace demand access to all available pools of positioning capital for maximum liquidity.”

It took four decades to create Weeden’s “electronic miracle.”

NASDAQ was first to automate. Other exchanges followed in 2005 after rules that negated the advantages of ATS were lifted. One such rule was the “trade through rule” under which all orders in NYSE shares were required to be exposed to the floor for a 30-second period for price improvement before trading. By early 2005 automatic trading networks (ATS) accounted for half of all trading.

Litzenberger noted that HFT has certain characteristics:
1. Market making that uses resting orders to quote two-sided prices and rapidly adjusts quotes in response to market conditions.
2. Profit reduced by adverse selection that comes from the bid–ask spread.
3. Directional trading that uses marketable orders and includes mean-reverting and momentum strategies.

In practice, he said, distinctions between market making and directional trading are less clear. As a result of regulatory change and the decimal rule, spreads declined between 1993 and 2002. They have declined further since 2006 and the onset of automated trading. The declines, Litzenberger said are directly related to HFT.

This is not only true in the United States. Citing the work of others, Litzenberger said that liquidity has increased, trade sizes have decreased, and block trades remain unused. In addition, there are positive trading revenues from HFT, although they have declined with greater competition.

Litzenberger summarized what we know as follows:
1. A large and growing body of evidence shows that the quality of the U.S. equity markets has improved significantly over recent decades. Many of the benefits can be attributed to improved competition, automation, and high frequency trading.
2. The benefits include a reduction in quoted and effective bid-ask spreads, an increase in posted liquidity at NBBO.
and within six cents of the NBBO, and a decline in the transitory price pressure impacts of large trades.

3. Net HFT marketable order flow is positively related to permanent price movements and inversely related to transitory price movements.

4. Marketable orders are sufficiently profitable to offset execution costs and the bid-ask spread. Resting orders earn sufficient spreads and rebates to offset the impact of adverse selection.

5. Large buy or sell programs implemented through execution algorithms and facilitated by HFT are consistent with the observed decline in trade sizes.

6. Net HFT resting orders are negatively related to permanent price movements and positively related to transitory pricing errors. To Litzenberger, this suggests that resting orders provide liquidity to informed traders and absorb adverse selection.

Much of the empirical evidence on the direct impact of HFT on the U.S. equity markets relies heavily on limited samples of proprietary data provided by NASDAQ and BATS to several financial economists. Broadening these samples to include other trading venues, including more stocks and time periods, and making the information more widely available, Litzenberger said, would result in more empirical research on a larger data set and more reliable inferences drawn from this data.

Finally, Litzenberger encouraged thoughtful initiatives such as pilot programs and structured deployments of rule and technology changes to provide the opportunity for further empirical study and better understanding of the markets.
Are We Headed for a Demographic Winter?

Presented by Joel Kotkin
Chapman University

Kotkin is a demographer who is worried about declining population growth and what that means for such things as aging, cities, and workforces. Using data from his worldwide research he provided plenty of food for thought on changing demographics.

Worldwide, birth rates are declining. Kotkin linked lower birth rates to changing views among women with respect to marriage and children. Citing survey results from 1976–2010, he said that an increasing number of women reported that they (1) never married/plan to marry and/or (2) never expected to have children. Japan is a stark example where the number of women who never married has increased from less than 20% to over 60% since 1920. Japan is not unique: by 2010 marriages in Spain had dropped to a 20-year low and there were fewer children in the country than in the 18th century. Declines in marriage rates are accompanied by new attitudes toward having children.

In another survey, Kotkin reported that when asked about the factors that are important in a good marriage, two factors — good housing and sharing chores — increased most in importance while the importance of children declined 37%. Kotkin said that lower birth rates are associated with expensive housing, ultra-competitive economies, a decline of traditional beliefs and, in advanced countries, growing pessimism about the future.

The impact on a society of declining birth rates is a declining workforce and aging population. This results in a high ratio of elderly to the, working age population and, in some countries the country’s penchant for male heirs, China’s “One Child” policy has produced an entire generation of men with few prospects of finding a wife.

As for what might mitigate this outcome, Kotkin suggested policies that foster:

- Immigration. An increase in immigration helps cushion the problem of a declining workforce and an aging population. Unfortunately, the impact is population decline in other countries. He pointed to several countries where the population decline due to emigration is already very serious.
- Lower housing prices relative to incomes.
- Increase in policies to foster shared responsibility by both parents. He likened this to policies already in place in Scandinavia.

He concluded that we need to ask ourselves four questions:

1. What is a city for?
2. What does sustainability (resilience) mean in the post-familial future?
3. How can high income societies reboot to accommodate families?
4. Is it worth it to let the current financial situation overwhelm the next generation?

Quoting Margaret Meade who said, “No matter how many communes anybody invests in, the family always creeps back,” Kotkin expresses hope for the family.
Can Financial Engineering Cure Cancer? A New Approach for Funding Large-Scale Biomedical Innovation

Presented by Andrew W. Lo
Massachusetts Institute of Technology

Can financial engineering cure cancer? Lo believes it can by bringing a new approach for funding large-scale biomedical innovation to the field of cancer research.

Lo believes that biomedical research is handicapped by the existing structure which he characterized as “an expensive, lengthy, and risky process that challenges traditional funding vehicles which are limited in size, scope, and risk appetite.” Specifically, he believes the current business model for life sciences research and development is flawed, as evidenced by the following facts:

1. The productivity of big pharmaceutical companies has declined in recent years, as has their stock-price performance.
2. The aggregate research and development (R&D) budget of the pharmaceutical industry has almost doubled from 2002 to 2010 with little appreciable impact on the number of new drugs approved.
3. Life sciences venture-capital investments have not fared much better.

Given declining real prescription-drug spending, rising costs, shrinking R&D budgets, expiring blockbuster patents, post-Vioxx fallout, lower levels of funding and risk tolerance among venture capitalists, and unprecedented stock-market volatility and uncertainty, Lo said that it is not surprising that the future of this industry appears so bleak. It is bleak in spite of many promising breakthroughs: stem-cell therapies such as bone marrow transplants; powerful new computational tools for medical imaging and radiosurgery; diagnostic applications of nanotechnology; the identification of biomarkers for certain diseases; the sequencing of the human genome; and patient specific gene based compounds. With past breakthroughs and new needs, why does the industry appear to be so challenged for funding, he asked? Lo concluded that there is a mismatch.

Biomedical research is complex, expensive, uncertain, lengthy, and fraught with conflicting non-pecuniary motivations and public-policy implications. Potential shareholders and limited partners are not the most effective funding sources: ownership of public equities implies constant scrutiny of corporate performance from many different types of shareholders; and limited partner investments are sparse. This pushes senior management of companies in this industry toward projects with clearer and more immediate pay-offs, and away from more speculative but potentially transformative research. The combination of an uncertain economy and the real concern about the availability of future rounds of financing deters venture capitalists. There is a preference for proven and economically viable technologies. In addition, recent evidence suggests there is the existence of a “valley of death”—a funding gap between basic biomedical research and clinical development.

Lo proposed an alternative for funding biomedical innovation through the use of “financial engineering.” The approach involves the creation of large diversified portfolios of projects and structuring the financing for these portfolios through combinations of equity and securitized debt. The specific form of the special purpose vehicle (SPV) is shown below.
Lo proposed creating an initial fund of $30 billion that invests in 150 early stage projects. He demonstrated that such an investment could provide a reasonable return while gaining the risk reducing benefits of diversification. Lo was compelling in his information and analysis and persuasive in his infectious passion as he urged the Q-Group participants to become early investors in the concept.

Lo admitted that this proposed application of securitization may be untested, but argued that the techniques are not. Rather than shying away from SPVs because of their role in the financial crisis, he advocated a more measured response that builds on their strengths to solve the most pressing social priorities such as cancer research and global warming. In today’s low-interest-rate environment investors are seeking new investment opportunities that are less correlated with traditional asset classes. Instead of asking whether we can afford to invest billions more at this time, Lo said we should be asking whether we can afford to wait.
Panel Discussion: Rethinking the Equity Risk Premium

Brett Hammond, MSCI

Hammond introduced the panel on the equity risk premium (ERP) noting that the session updates the ERP views and research discussed at a 2001 Research Foundation of CFA Institute forum of experts. At that time estimates of the ERP ranged from zero to 7%.

The 2001 forum produced a schematic (shown below) of what constitutes the ERP, including investment horizon, supply-demand imbalances, and the level of demand for a return to compensate the risk of equities. In addition, it dealt with whether the markets exhibit rational expectations or suffer from behavioral distortions.

One thing was widely accepted by all in attendance at the 2001 event: few institutions or individuals explicitly address these issues and even they fail to consider the size of the equity premium itself in forming policy portfolios and determining asset allocation.

Hammond said that the equity risk premium is the most important measure in all of finance. It impacts saving and spending behavior, as well as the critical riskless and risky assets allocation in investors’ portfolios. The problem posed by recent history is that we may not be confident in our understanding of equity risk and, therefore, in our forward looking decisions.

After several decades during which realized equity returns followed a welcome positive pattern, the past decade has seen a marked downturn in equities. The decade was characterized by much lower-than-average returns and higher volatility, rising cross-asset, cross-country, cross-sector, and intra-sector correlations, and two of the biggest bubbles in stock market history. This downturn prompted some investors to suggest that future expectations for equity returns versus other broad asset classes must be permanently adjusted downward. Others argue that the same evidence suggests equities are poised for outstanding future excess returns.

Hammond suggested we sort through the best thinking on the ERP and look particularly at the most important drivers of the premium. In 2011, these issues were revisited in a forum where a number of academics reported their research. From that meeting they developed a series of charts showing the different facets of the ERP. These included such things as interest rates, objective and circumstantial drivers, different levels of inflation and earnings expectations. He provided the following chart to show the relationship between the factors and three interest rate levels.
He identified a “sweet spot” associated with moderate real long-term interest rates (2–3%), and demonstrated why it is “sweet” in the chart below.

This brought Hammond to what he calls the “risk premium smile”—the relationship between real rates and the ERP (shown below).

Hammond concluded that the past 10 years have shown that the ERP is far from being a settled matter. He proposes that (1) estimates of ERP be explicit and (2) the model used to make the forecast be clearly described. Finally, Hammond said that it is clear that circumstances and differences among investors lead to true and irreducible differences in the ERP.

**Marty Leibowitz, MSCI**

Leibowitz looked at a series of hypothetical return models under the assumption of rising rates. He said that an asset’s return premiums can be viewed as incremental returns for accepting the prospective risks. Thus, higher premiums may not be a bargain but may be an indication of greater prospective risks and/or lower growth prospects.

He described models he created based on the following assumptions:

- Bonds: zero coupon with a duration of 5, initial yield of 2% and rate volatility of 1%.
- Equities: a risk premium over bonds of 3.5% and a volatility of 16%.

In these models rates were allowed to drift at various rates. The multi-year returns for bonds are shown below.

The following table shows the multi-year returns for equities.

From this Leibowitz constructed the following chart combining a stable risk premium and a 0.3% drift. The results, he said, are inherently overstated in accepting higher expected returns without fully addressing the greater prospective risks.
Finally, he reminds us that these models should be viewed as strictly hypothetical illustrations and are not to be taken as market projections.

**Bill Sharpe, Stanford University**

Sharpe opened his presentation with a Casey Stengel quote, “Never make a prediction, especially about the future,” a perfect prelude to a discussion of the equity risk premium. Sharpe started with a little CAPM history that assumes that market risk alone is rewarded with higher expected returns. This, he said, is an incomplete model and he then discusses a state dependent model. This model includes alternative future states of the world (though one and only one will occur) each accompanied by an estimated probability. In this model it is possible to buy and sell state claims by comparing the price of the claim with the likelihood of cashing in on it. As a cost he uses the ratio of the state price to the probability of that state price per chance (PPC). The higher the PPC, the less attractive is an investment. Rational investors, he said, take more of a thing (or investment) when it costs less, with PPC being the measure of cost.

The market portfolio using this approach is shown in the following chart. States with the same wealth will have the same PPCs, and states with more wealth will have lower PPCs. The individual makes the choice based on a personal PPC–wealth trade-off.

Sharpe then turned to communicating with investors about risk and return. He said that return/standard deviation is not a particularly useful paradigm to use when distributions are not normal. It is preferable to show the entire cumulative probability distribution using a graph where the investor’s goal is plotted on the X axis and the chance of exceeding the goal on the Y axis. In this way the client has a visual demonstration of the outcomes associated with the probability of meeting the goal.

**Laurence B. Siegel, Research Foundation of CFA Institute**

Siegel updated a Grinold and Kroner ERP model that segregates expected equity returns into several understandable pieces (income, earnings growth, and re-pricing. The model shows that the expected equity return over any period is definitionally equal to:

\[ R = \frac{D}{P} + \Delta S + i + g + \Delta PE. \]

Siegel used this identity as a template for a discussion on how to best estimate each variable, how to determine the accuracy of each estimate, and other issues relevant to long-term forecasting.

Siegel then defined ERP as the expected equity total return less the yield on the 10-year Treasury. He noted that, in retrospect, the Grinold and Kroner (2002) forecast was too
high. The main problem in their forecast was the volatile repricing term: they made no serious attempt to estimate the speed with which the unusually high P/Es prevailing at the beginning of the decade would revert toward their historical mean. Siegel said that they understandably got it wrong since market repricing tends to happen all at once.

Siegel then turned to data that he believes are appropriate for making estimates at this time. Because now he views the market as roughly fairly priced after two bear markets and two recoveries. He uses a repricing rate of zero, cautioning that the repricing term is noisy. As a result of the forecast with revised inputs, he said he expects moderate stock market growth in the future. His paper projects an expected equity risk premium over the 10-year nominal Treasury bond of 3.6% (geometric). By the time he presented the paper at the Q Group, he said that falling interest rates caused the estimate to increase to 4% (geometric).

Siegel summarized his paper by saying that although Black Swans, fat tails, and tsunamis are the talk of the day, such large unexpected events tend to fade in importance over extended periods. It is only then that the underlying long-term trends reveal themselves once more.
Does Mutual Fund Size Matter: The Relationship between Size and Performance

Presented by Edwin J. Elton and Martin J. Gruber
New York University

In earlier work, Elton and Gruber found that mutual fund managers’ past performance was predictive of future performance. Others, such as Berk and Green (2004), argued that past performance should not predict future performance. Elton and Gruber’s research directly addresses the Berk and Green results and comes to different conclusions.

To determine whether there is predictability of performance, they use variations of the well-known Fama–French (FF) model and weekly information on all domestic common stock funds in the CRSP database from 1999–2009. They exclude funds with less than $15 million in assets, less than three years of history, or an $R^2$ that is less than 0.6. In addition, they exclude index, sector, life cycle and flexible funds and they eliminate funds backing variable annuity products.

For each fund they compute an alpha (α) in the ranking year and use it to form deciles. They then examine the subsequent year’s α, finding that the top decile stocks have a positive and significant alpha: the top decile outperforms the index by 1.5% per year as shown below:

<table>
<thead>
<tr>
<th>Decile</th>
<th>Average Evaluation Alphas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carhart 4-Fact Plus Bond Factor 5-Factor Model</td>
<td>Evaluation Alpha</td>
</tr>
<tr>
<td>Decile 1 (lowest)</td>
<td>-0.048</td>
</tr>
<tr>
<td>Decile 2</td>
<td>-0.027</td>
</tr>
<tr>
<td>Decile 3</td>
<td>-0.020</td>
</tr>
<tr>
<td>Decile 4</td>
<td>-0.021</td>
</tr>
<tr>
<td>Decile 5</td>
<td>-0.016</td>
</tr>
<tr>
<td>Decile 6</td>
<td>-0.015</td>
</tr>
<tr>
<td>Decile 7</td>
<td>-0.011</td>
</tr>
<tr>
<td>Decile 8</td>
<td>-0.003</td>
</tr>
<tr>
<td>Decile 9</td>
<td>0.004</td>
</tr>
<tr>
<td>Decile 10 (Highest)</td>
<td>0.030</td>
</tr>
<tr>
<td>Spearman Corr.</td>
<td>0.988</td>
</tr>
<tr>
<td>p-value</td>
<td>&lt;.0001</td>
</tr>
</tbody>
</table>

Gruber noted that the probability of getting an alpha as high as this is considerably less than 1%.

Berk and Green suggested that a successful manager would capture excess return by increasing expense ratios. To test this, Elton and Gruber estimate expense ratios for each decile and find that the 10th decile has the lowest expense and turnover ratios. Further, they find that expense ratios tend to decline over time as shown below:

| Average Change in Expense Ratio in Years Following Ranking Year Where Funds are Ranked by Alpha |
| Decile | 1 Year | 2 Year | 3 Year |
| 1 | 0.0144 | 0.0155 | 0.0066 |
| 2 | 0.0070 | 0.0043 | -0.0005 |
| 3 | 0.0054 | 0.0083 | -0.0001 |
| 4 | 0.0018 | 0.0011 | 0.0004 |
| 5 | -0.0004 | 0.0027 | 0.0029 |
| 6 | 0.0021 | -0.0046 | 0.0007 |
| 7 | 0.0017 | -0.0024 | 0.0040 |
| 8 | -0.0048 | 0.0006 | -0.0035 |
| 9 | -0.0052 | -0.0012 | -0.0049 |
| 10 | -0.0217 | -0.0050 | -0.0057 |

Elton and Gruber employ regression analysis to explain the alpha using a variety of variables including cash flows for the fund, its size, the prior year expense and turnover ratios, and the mutual fund family size. They conclude that there is a strong relationship between past and future alphas. In addition, they find the following:

1. The best performing funds produce positive future alphas.
2. Growth in fund size erodes predictability, but slowly.
3. Size is not as important as past speculation would suggest.

Gruber concluded that performance and predictability don't disappear for large funds for two reasons:
1. Expense ratios go down with size.
2. Size and particularly fund flows lead to either larger trades or more investments.
3. Large funds may gain better quality analysts (they can pay more) or command the best resources of the fund family to which they belong.
Health Care Reform in the United States: Past, Present and Future

Presented by Jonathan Gruber
Massachusetts Institute of Technology

On the afternoon of the second U.S. Presidential Campaign debate of 2012, Gruber presented the history of the U.S. Patient Protection and Affordable Care Act (PPACA), legislation widely called Obamacare. He is uniquely qualified for this role. Why? Jonathan Gruber had a major role in designing the Massachusetts Health Care Reform law, signed by Governor Romney and widely called Romneycare, as well as the PPACA, signed by President Obama. Both Romneycare and Obamacare establish health insurance exchanges, prohibit insurers from denying coverage for pre-existing conditions, allow adult children to stay on their parents' insurance until age 26, and include the controversial individual mandate. This mandate, proposed earlier by the Heritage Foundation, requires individuals to obtain health care or face a penalty. This mandate was designed to improve insurance rates for all and to eliminate the “free rider” problem of uninsured patients seeking care at emergency rooms.

The Affordable Care Act is a major law and a substantial change in our system, but it does not really kick in until 2014. Most important at this point in time is to understand the law and not assume the politically-based assessments are true. Gruber said that the biggest misconception of the national legislation is that it is some sort of socialism or federal takeover of the health-care system. Unfortunately this and other misconceptions (e.g., calling physician counseling of elderly patients “death panels”) are still given credence. The whole idea of the Affordable Care Act is to build on the existing private health-insurance system. He notes that the Massachusetts law and subsequent experience with it is proving to be a live experiment for the national health care reform.

Before concluding, Gruber discussed the challenges involved in managing health care costs and what has been done in other countries. Regarding the high the cost of drugs in the United States, he said that high prices subsidize low prices in the rest of the world. He said that this is an issue that needs to be addressed, among others, including Medicare reform.

For more information on health care legislation, see Gruber’s book entitled Health Care Reform (Farrar, Straus and Giroux, 12/20/2011) in which he explains in a graphic novel style the complicated piece of legislation.
Momentum Crashes

Presented by Kent Daniel
Columbia University

Momentum strategies, a bet that past returns have predictive value, have produced high returns and strongly positive alphas. Past research has shown that momentum is pronounced and pervasive among many asset classes around the world, though it is considered by many to be an anomaly. The problem with this strategy is that returns to momentum strategies are highly skewed and sometimes result in what Daniel called “momentum crashes”—strong and persistent strings of negative returns. In this research, he asks why “momentum crashes” exist and whether they are forecastable.

Daniel said that momentum crashes tend to occur in times of market stress, specifically when the market has fallen and ex-ante measures of volatility are high. These patterns are suggestive of the possibility that the changing beta of the momentum portfolio may be partly responsible for momentum crashes. They also occur when contemporaneous market returns are high. Daniel asked, are they predictable?

To analyze this question, Daniel creates 10 momentum portfolios using monthly and daily CRSP data from 1947 through 2007. He finds a strong momentum premium over this 50-year period: the winning decile had an excess annual return averaging 15.4% and the losing decile averaged an annual loss of 1.3%. The average excess market return was 7.5%. Daniel said that from 2009–2010 momentum outperformed as they did during the period of the Great Depression.

Separating winners and losers as of March 2009, he finds that many of the firms in the loser portfolio had fallen by 90% or more. In that group were Citigroup, Bank of America, Ford, and GM. The loser companies were often extremely levered, at risk of bankruptcy and, Daniel said, their common stock was effectively an out-of-the-money option on the firm value. In contrast, the winner portfolio was composed of defensive or counter-cyclical firms. This suggests to him that there are potentially large differences in the market betas of the winner and loser portfolios. The following chart shows the cumulative gains from market, past winners and losers and the risk free asset. The lines appear in the order they are listed in the legend.

In addition, he said that there is a strong up and down market beta (β) differential between the two different momentum portfolios. The following chart shows the beta of the Loser Portfolio. It the more volatile line.

Daniel said that there are clear payoffs associated with the winner minus loser (WML) portfolio. The portfolio has short-option-like
characteristics that appear to be more costly when market variance is higher. This is consistent with behavioral motivations for the premium and suggests that crashes are forecastable. Daniel investigates whether other variables associated with perceived risk, such as realized volatility, affect the payoff to momentum strategies.

Looking at a variety of time periods, bear and bull markets, and different asset classes in the United States and other countries, Daniel concluded that:

1. While past winners have generally outperformed, there are relatively long periods over which momentum strategies experience severe losses.
2. “Momentum crashes” do not occur over a single day but are spread out over the span of several days or months.
3. Because of the magnitude of the losses from these crashes, momentum strategies can experience long periods of underperformance.

4. The most severe momentum underperformance appears to occur following market downturns and when the market itself is performing well.
5. The crashes occur after severe market downturns and during a month when the market rose, often dramatically, and were clustered in July and August.

Looking at various kinds of markets, Daniel reported that in bear market states, and in particular when market volatility is high, the down-market betas of the past losers are low, but the up-market betas are very large. This optionality does not appear to be reflected in the prices of the past losers. Consequently, the expected returns of the past losers are very high, and the momentum effect is reversed.

Daniel concluded by saying that the evidence is loosely consistent with several behavioral findings. In extreme situations when individuals are fearful, they appear to focus on losses and probabilities are largely ignored. Whether this behavioral phenomenon is fully consistent with the empirical results documented here, he says, is a subject for further research.
Speculative Betas

Harrison Hong
Princeton University

When and why does the Capital Asset Pricing Model (CAPM) “fail?” Frequently, it turns out. We even have a name for these “failures”—anomalies. Hong pointed to one failure—the beta-neutral strategy of long low-beta/short high-beta stocks. This strategy should not work, he said, and yet it does. In practice it provides a positive Sharpe ratio. Regarding these anomalies Hong said he has developed both a theory and evidence for why and when these “failures” occur.

Over the past 20 years, financial economists have developed a large and impressive body of findings that reject the CAPM beta as sufficiently explaining the variation in asset returns. These results have led to a search for multiple factor models. Hong said that the debate over how to interpret these asset pricing patterns ignores the idiosyncratic behavior of the theoretical upward sloping Security Market Line (SML). There is suggestive evidence, he said, that the risk and return relationship is not strong, and is reverse of what you would expect.

Hong’s thesis is that investor disagreement about the common factor of cash flows leads to the observed behavior. He believes that high-beta assets are more sensitive to disagreement than are low-beta assets, and thus experience a greater divergence of opinion about their cash flows. Costly short-selling then results in high-beta assets coming up against binding short-sale constraints and being overpriced.

Hong created a model that incorporates the speculative motive for trading into traditional asset pricing models. It yields strikingly different results from the risk-sharing or liquidity motive model: high-beta assets are more speculative since they are more sensitive to disagreement about common cash flows. When disagreement is low, the SML is upward sloping. As opinions diverge the slope can be initially positive and then negative for high-beta assets. Thus, the empirical results should show:

1. An upward sloping SML when disagreement/uncertainty is low.
2. An inverted U-shaped SML when disagreement is high.
3. More stock-level disagreement on high β stocks, especially when there is high aggregate disagreement.
4. More shorting of high β stocks, especially when there is high aggregate disagreement.
5. More turnovers on high β stocks, particularly when there is high aggregate disagreement.

Using security analyst disagreements, Hong’s empirical tests confirm the predictions. He verifies the notion of a speculative mechanism by finding that high-beta stocks have much higher individual disagreement about cash flows, higher shorting, and higher share turnover than do low-beta stocks. He also finds that these gaps grow with aggregate disagreement. The following chart shows the outcomes for high and low levels of disagreement.

These empirical tests show that high-beta assets can be more speculative and thus yield lower expected returns than low-beta assets. This finding, he said, cuts directly at the heart of what we teach finance students in terms of how to price risk and may have important implications for capital budgeting decisions.