"THE Q-GROUP"©

**THE INSTITUTE FOR QUANTITATIVE
RESEARCH IN FINANCE®**

FALL 2011 SEMINAR PROGRAM

The Ritz Carlton, Laguna Niguel, Dana Point, California
October 16 - 19, 2011

www.q-group.org

INTRODUCTION, SUMMARY AND CONCLUSIONS

The Q-Group® provides a number of ways for the attendees and their colleagues to access the presentations from past meetings. First there are brief overviews of the themes and insights presented during a meeting, such as the ones shown below for the Fall 2011 Q-Group® Seminar series. If you want more information about a particular presentation after reading these, you can read the full summaries of each presentation which are also in this report. For even more information, copies of the slides used during each presentation and the paper from which the presentation was derived, as well as the complete audio recordings for each presentation and question and answer period are available from the Q-Group website at *The Q-Group*: The Institute for Quantitative Research in Finance.

Themes and Insights Fall Meeting 2011

There were several important themes of the Fall 2011 Q-Group® presentations. All had at their core important messages for both investment practitioners and scholars as well as public policy makers. The topic of the Fall 2011 Q-Group® Seminar, "Beta, Diversification and Innovation," was apt but incomplete. The subtitle helps understand the tenor of the seminar, "Danger, New Challenges Ahead" since the seminar was all about old, present, and new challenges and the resulting dangers and opportunities. There was plenty of useful food for thought.

True to the theme of the Seminar, one group of papers took on the challenge of using beta and understanding it. These papers use our increasing knowledge of the markets and how they work to extend the notion of beta.

> The first presentation of the Q-Group® Fall 2011 meetings was by Mark Carhart who proposes the use of "exotic betas", a variation on the traditional beta, in creating higher return portfolios. A source of return that lies on the continuum from traditional beta to alpha, exotic betas include return sensitivity to such things as currency and credit. When used to create portfolios the returns are superior to those based on other widely used portfolio strategies.

> Addressing the CAPM directly, Frazzini examines the source of a long lived and unexplained anomaly: the lower slope of the empirical Capital Market Line. This slope issue is troubling given the model's assumption that investors can shift their portfolio's risk and return using a combination of the market portfolio and leverage or borrowing. Theoretically interesting, this notion is not realistic. What is realistic is that investors with access to leverage, such as hedge and private equity funds, buy low-beta securities and lever their portfolios, and those restricted by leverage constraints, such as mutual funds, prefer high-beta assets to obtain higher returns, thus bidding up high-beta assets. The reasonable conclusion is that investors limited only by margin requirements can trade to profit from this insight.

Leverage takes on a different role when Barry Nalebuff deals with another hot topic in portfolio management: life cycle investing. In particular he looks at what might be called an extreme version of life cycle investing where younger investors invest all their financial capital in equities and borrow against their human capital to increase equity exposure to 200%. The exposure declines to 50% over their investing life. When compared to a constant proportion allocation over the lifetime of the investor, the extreme portfolio is less risky. He notes that leverage should not be thought of as extreme in this context since it is familiar and accepted when buying a home or car.

A frequent topic at Q-Group® seminars is finding assets, particularly stocks,that will outperform. In the past many saw anomalies, and short term ones at that, as fleeting sources of alpha. Recently there has been greater focus on finding non fleeting sources of excess return, or gaining greater insight into market data.

David Hirshleifer looks at whether stock prices fully and immediately impound the arrival of relevant public information about innovative efficiency. In this case he is referring to the ratio of a firm's patents to its R&D expenditures. He finds that their innovative efficiency ratio predicts subsequent abnormal returns, though it is impacted by the salience of the information and level of investor attention.

Robert Novy-Marx discusses gross profitability and its power to predict cross-sectional returns. He finds that it is a much stronger predictor than earnings or free cash flows. Indeed, it has almost as much power as the familiar book-to-market ratio it is negatively correlated with and helps distinguish high return "good growth" stocks. In addition profitable firms are less prone to distress, have longer cash flow durations and lower levels of operating leverage. Controlling for gross profitability explains most earnings-related anomalies.

Another way to forecast the markets, Michael W. Brandt reported, is to use orderflow which represents actions of investors as opposed to returns that reflect consequences: orderflow is the conduit through which information about economic fundamentals is aggregated into asset prices. Brant focuses on sector rotation, one of the many strategies investors use to adjust their portfolios in response changing views about economic fundamentals. He finds that orderflow contains unique information not already included in prices. As for practicality, Brandt translates sector orderflow movements into tilts to the market portfolio that produce an orderflow mimicking portfolio that has superior risk and return properties relative to both the traditional market and to industry momentum portfolios. This is because, he says, orderflow contains asymmetric information that it is primarily defensive in nature and largely related to wealth preservation.

One continuing theme at the Q-Group® seminars, and this one was no different, has been the factors and events behind the "Financial Crisis of 2007-08." The factors and results from that Crisis still endure and have traveled all too well. During the Q-Group®'s Fall 2011 meetings innovative thinking and research added more to our understanding of the financial

crisis' causes and focused on the changes that must be addressed lest we continue to see the spread of similar problems.

Maurice Obstfeld says the Crisis laid bare global stresses related to the two problems the IMF was originally designed to address: international liquidity needs and exchange rate imbalances. His key message is that a diverse set of potential asymmetries among sovereign member states provides fertile ground for a variety of coordination failures. This is a key starting place for predicting a range of tensions in any system of international monetary arrangements and compounding these problems is globalization. Obstfeld provides a tutorial on the range of problems that exist before prescribing reforms and, to make his points all the more current, provides his outlook for Greece about which he is very pessimistic.

Anat Admati provides a closer look at the role bank capital ratios have played and are playing in the current EU Financial Crisis. She asks a series of provocative questions. Was it mainly (or just) a liquidity problem, a run that affected a wonderful but inherently fragile modern banking system, or the result of excessive leverage, risk and distorted incentives? Can a large financial institution "fail?" Can bankruptcy or regulation be made to work? What is systemic risk and what are systemically important financial institutions? What are the costs and benefits of regulation? Pointing out that health and safety issues arise in other regulated industries: airlines, medicine, environment, nuclear plants, she asks, "Should financial institutions be included in this group?" She provides a thorough analysis of one solution (increasing bank capital ratios) and says after the Financial Crisis the burden of providing a compelling argument for why high leverage of banks is justified must be on those making the claim. Policy should not be made on the basis of fallacious claims and must be based on social costs, benefits and solid reasoning. Finally, she asks, "Why do investors/shareholders allow banks to lobby against sensible regulations using flawed claims?"

Robert Arnott looks to the future and says that we are about to be hit with a "Triple D Hurricane: Debt, Deficits and Demographics." It seems likely to him that the demographic profile of a nation ought to influence the rate of GDP growth and perhaps capital market returns as well. He examines potential demographic shifts for a large number of countries and universally finds that highest GDP growth is associated with young adults 20-39 and that stocks perform better when the 35-59 age cohort is larger. He turns his findings into forecasts for GDP and its growth and for stock and bonds market returns around the world from 2011-2020. He calls these forecasts for the next 10 years sobering, and they are both sobering and create challenges and opportunities for many, including investment professionals.

In many ways our research has become better as more and better data is available. That is not true in one area, hedge funds: the data is not freely available and often not available at all.

David Hsieh creates a database that covers more of the hedge fund industry. Much of his data is private and he says that commercial databases now contain a declining share of total hedge fund industry AUMs. Using his proprietary data he creates a value weighted S&P-like hedge fund analog of institutional quality firms that is a good proxy for the hedge fund market portfolio. It will be interesting to see results of his future research using the data set he has created.

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1. Revisiting Exotic Beta

The first presentation of the Q-Group Fall 2011 meetings was made by Mark Carhart, Kepos Capital LP, who presented "Exotic Beta Revisited" coauthored with his Kepos colleagues: Ui-Wing Cheah, Giorgio De Santis, Joe DeLuca, Bob Litterman and Attilio Meucci.

This paper addresses the very focus of the Seminar, "New Challenges Ahead: Beta, Diversification, and Innovation," by providing an analysis of and tutorial on creating portfolios using "exotic betas" rather than relying on the traditional asset-class allocation approach.

Carhart starts with the traditional CAPM: a one period, one factor model with expected returns that are linearly proportional to the market beta and with unpredictable residual returns. He provides the following to show his view of the returns' continuum for the various models.
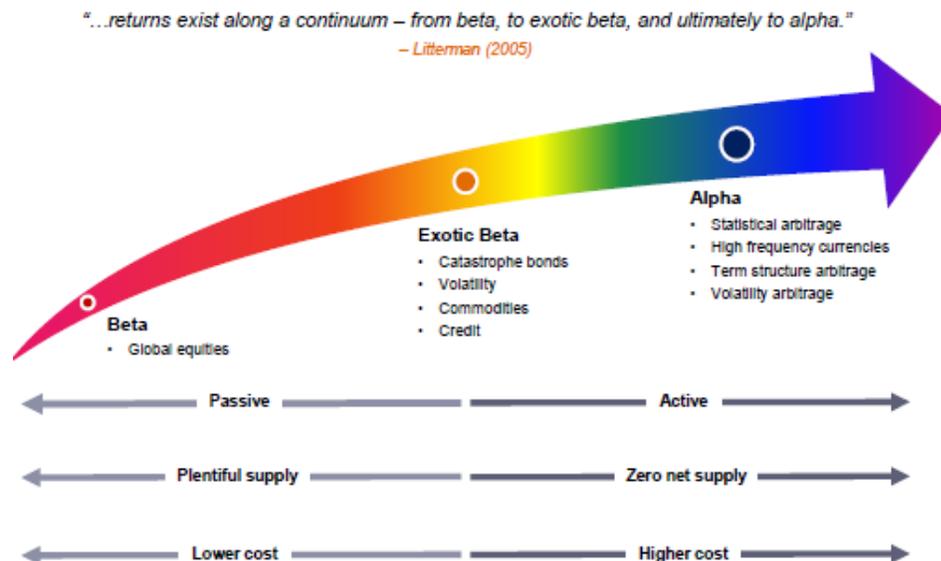
The so called "exotic betas:"
1. Are not the market beta. They are risk exposures that have positive risk premia uncorrelated with global market risk.
2. Reflect observable variations in risk premia over time that can be exploited to improve both the risk and return of a traditional portfolio.
3. Result from risk premia related to long-term risk factors.
4. Are
   a. A source of uncorrelated returns not created by short-term inefficiencies.
   b. Transparent, relatively well known and intuitive, and include such things as time horizon, capacity, and liquidity. Perhaps most importantly, they reflect a judgment about whether there is a real or perceived risk that justifies a premium.

c. More transparent and liquid and have more capacity than other sources of active alpha.

What differentiates exotic betas from the market beta, Carhart says, is simply the source of the premium. A good example of an exotic beta is value investing, although most investors think of value investing as a style or a result of manager skill, not a risk factor. He argues that we can and should separate the exposure to a risk factor (created by a passive tilt toward a value equity benchmark) from the skill needed to create the alpha that would outperform such a benchmark. He goes on to describe how this can be done.

He also lists other examples of risk factors including certain asset classes, well known factors such as HML hedge fund strategies and "insurance-like" tools including credit default swaps, catastrophe bonds and out-of-the-money put options.

Carhart offered following explanations for the value of "exotic betas:"
1. Behavioral: most investors do not behave in the perfectly rational manner. While theory suggests that investors are concerned with the risk of their portfolio, they do in fact, worry about the volatility of individual assets. In addition, they worry about assets that have declined in value.
2. The importance of liquidity.
3. The impact of leverage.

As important as it is to know the sources of value that come from "exotic betas", it is important to recognize when the embedded premium ceases to exist.

He then discusses "exotic betas" noting that the following exist:
1. *Equity Value:* long exposure to countries with the highest fundamental value relative to price hedged by short exposure to the opposite.
2. *Bond Yields:* GDP-weighted combination of sovereign bonds.
3. *Bond Yields Value:* long the sovereign bonds in countries with the highest yields and short those in countries with the lowest yields.
4. *Term Structure:* long the sovereign term structure in countries with the steepest curves hedged by short the opposite.
5. *Commodities:* volume-weighted combination of commodity futures subject to constraints of 50% in the energy sector, tilted towards commodities with the greatest backwardation in prices.
6. *Real Assets:* market cap weighted combination of REIT securities.
7. *Currency Value:* long exposure to high interest rate and weak purchasing power parity currencies hedged by short exposure to low interest rate and strong PPP currencies.
8. *Volatility:* short equity index volatility in most market conditions except long equity index volatility when there are signs of significant financial stresses ahead.
9. *Credit:* equal-weight combination of the 6 major credit sectors: US investment grade, US high yield, European investment grade, European high yield, mortgages and asset-backed securities.

10. *Catastrophe Bonds:* market cap weighted combination of bonds linked to catastrophic reinsurance risk.

Carhart compares the "exotic beta" approach to a portfolio concept known as "risk parity," an approach that normalizes various asset classes to constant risk and then equal-weights them in a portfolio, and to hedge fund replication. He concludes that "exotic beta" is more complex and requires more judgment to refine, but seems to generate better return and risk characteristics. He provides as evidence the chart showing the risk/return tradeoff for the various portfolios. Regardless of the approach, these liquid and transparent strategies can considerably enhance the performance and risk of a traditional portfolio.

In conclusion, Carhart says that one of the many investment themes that survived the financial crisis is that exposure to "exotic beta" is very attractive in a portfolio context. However, as he explores in this paper, an important caveat is that such exposure should not be expected to be completely static over time. In addition to being dynamic, Carhart believes it is optimal for investors to access these risk premia in relatively lower cost, more transparent and customized implementations. Based on his impression of currently available products, he concludes the industry is already headed this way.

2. The International Monetary System: Living With Asymmetry

Maurice Obstfeld, Class of 1958 Professor of Economics and Director of Center for International and Development Economic Research (CIDER) at the University of California at Berkley, NBER, and CEPR presented "The International Monetary System: Living with Asymmetry."

Obstfeld says that the Financial Crisis laid bare global stresses related to the two classic coordination problems the IMF was originally designed to address: global liquidity needs and exchange rate imbalances. The problems are similar to those of the Bretton Woods era, pre-1973, and yet quite different. He analyzes the current stresses in the two key areas that concerned the architects of the original Bretton Woods system: international liquidity and exchange rate management. He finds that many of the coordination problems that arise stem from differences in the structures, growth rates, and cyclical positions of the mature economies and the developing world: segments of the global economy that are fast approaching equality.

The key message of Obstfeld's work is that a diverse set of potential asymmetries among sovereign member states provides fertile ground for a variety of coordination failures. While obvious, he says, this point is a key starting place for predicting a range of tensions in any system of international monetary arrangements. The floating exchange rate, one of the Bretton Woods' innovations, did not fix everything. The demand for international reserves is still high and the modified Triffin problem - the supply of international liquidity in settings where the demand for safe foreign exchange reserves grows faster than the supply over the long term - is still present. There is no rapid return to nearly balanced current accounts. Distributional and allocative effects still exist, particularly for emerging market economies. Even though there have been some successes, every bilateral exchange rate continues to be shared by two countries and external adjustment imperatives remain unequal.

Compounding these problems is globalization. One of the systemic, globally interdependent, risks comes from inflated gross asset positions. Obstfeld uses the chart on the next page to show the positions for six major countries. The legend left to right mimics the graph's lines top to bottom. Clearly Switzerland and the UK are in the strongest positions.

Gross external positions as a multiple of GDP, 1970-2007
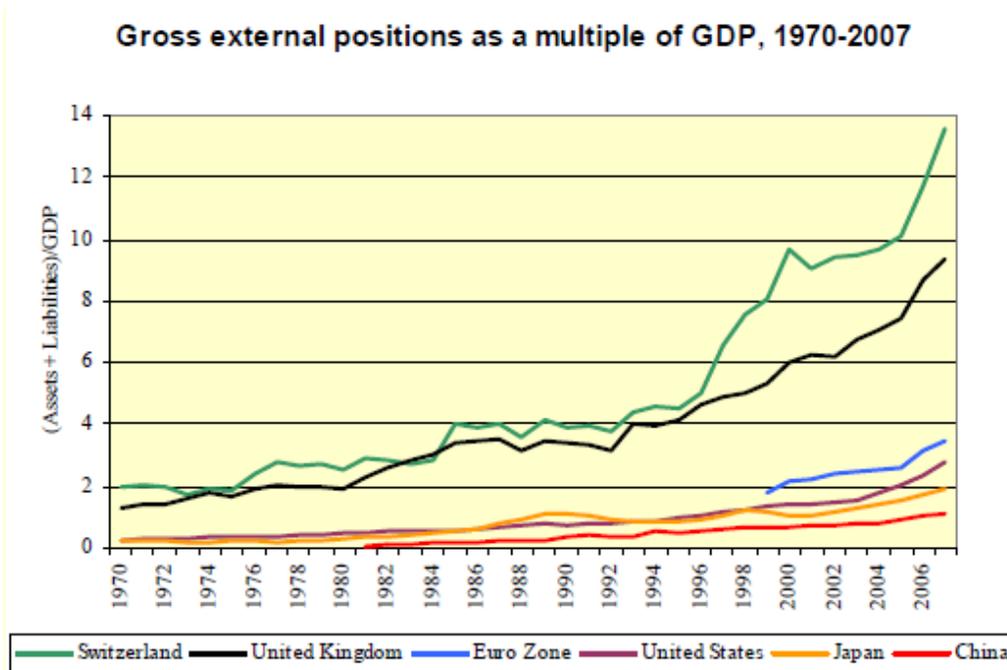
He then looks at net external assets to demonstrate the problems in the financially troubled countries. The graph for one country, Ireland, shows its gross external assets and liabilities at a startling 14 times GDP.

Ireland: Gross External Assets and Liabilities
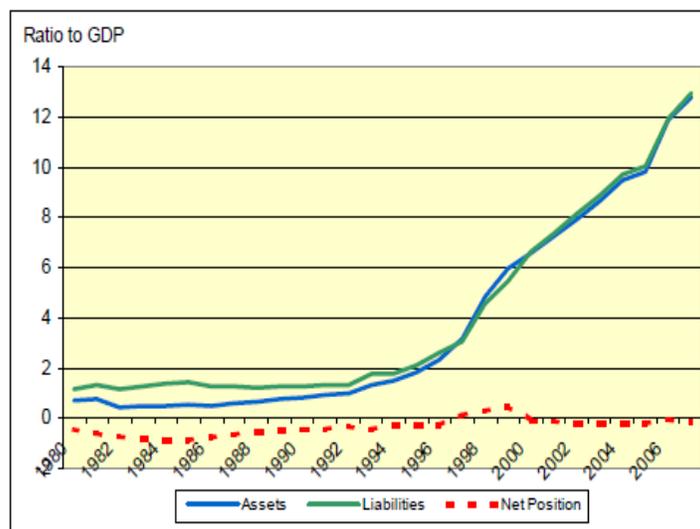
Obstfeld says that there is one overwhelming need: liquidity in the international system. However, there are two issues: heightened sovereign debt risks for richer countries and the need for lender-of-last-resort (LLR) support in multiple currencies to safeguard financial

stability for all countries. Until recently, Obstfeld says, domestic LLR seemed sufficient. Now it does not. He provides an outline of the system at work and its flaws before turning to better ways to meet market liquidity needs.

Obstfeld concludes that in this world there is a connection between the extent of policy cooperation over macroeconomic policies and the need for international liquidity. The more cooperation (the more carefully coordinated national policies are in timing and nature) the lower the need for international liquidity to finance imbalances. A collateral benefit of such cooperation is that it can mitigate other coordination failures in national economic policies. Unfortunately, these continue to cause tensions between governments and there are no easy solutions in a world of sovereign nations. Reforms that enhance the IMF's freedom from political pressures would allow it to identify and critique global coordination failures with greater impartiality and credibility.

To his extensive tutorial he summarizes the main challenges at the regional and global levels:
1. National sovereignty and self-interest as expressed through democratic political processes that frequently are not inherently friendly to globalization.
2. Globalization of governance institutions must expand to support the expanded globalization of markets.

As for the current threat, Greece, he was very pessimistic about the timing and the impact of the potential bail out.

3. Betting Against Beta

Andrea Frazzini, Assistant Professor of Finance, The University of Chicago Graduate School of Business, AQR Capital Management, LLC and NBER, presented "Betting Against Beta," he coauthored with Lasse H. Pedersen, John A. Paulson Professor of Finance and Alternative Investments, New York University Stern School of Business and CEPR and NBER.

Frazzini starts with the basic Capital Asset Pricing Model premise: all agents invest in the portfolio with the highest expected excess return per unit of risk and lever or de-lever it to suit their risk preferences. While true in theory, in 1972, Black, Jensen and Scholes showed that the empirical risk-return slope is lower than the predicted 45 degree angle. This is an anomaly, Frazzini says, that has never been resolved; though, he points out, borrowing constraints may be the culprit.

Frazzini means to deal with the notion that investors prohibited from leverage bid-up high-beta assets while those limited only by margin requirements can trade to profit from this, at least to the limit of their margin constraints. Thus leverage constrained investors will resort to over-weighting risky, high beta, securities to increase their return. This behavior of tilting towards high-beta assets suggests that risky high-beta assets require lower risk-adjusted returns than low-beta assets – those that require leverage.

Frazzini creates a model to test whether high-beta assets require lower risk-adjusted returns than low-beta assets. They test the model's predictions within U.S. equities, across 20 global equity markets, for Treasury bonds, corporate bonds, and futures. The data for the test are collected from several sources and result in the inclusion of 50,826 U.S. and global stocks covering 20 countries. The authors consider alphas with respect to the market and US factor returns based on size (SMB), book-to-market (HML), momentum (UMD), and liquidity risk. In addition to data on bonds, data for forwards and futures are used and detailed. They use the TED spread as a proxy for time periods where credit constraints are more likely to be binding. Frazzini reports that they find that for each asset class a betting-against-beta (BAB) factor, long a leveraged portfolio of low-beta assets and short a portfolio of high-beta assets, produces significant risk-adjusted returns. In addition, he says, when funding constraints tighten, betas are compressed towards 1.0, and the return to the BAB factor is low.

Frazzini provides considerable detail about their analysis. The chart below shows a sample of their findings in graphic form. Here we see the plot of the annualized Sharpe Ratio of BAB factors for all the asset classes. All but one is positive.
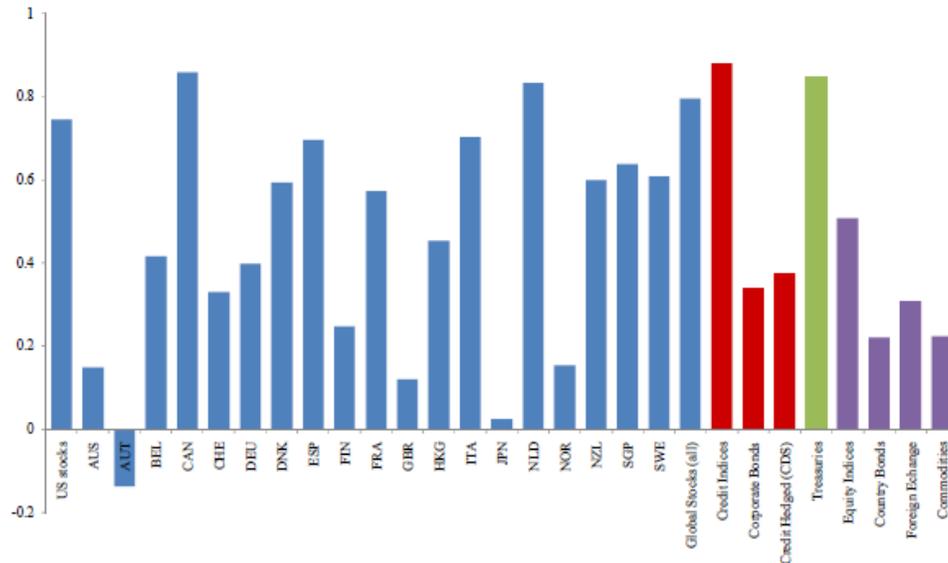
To show the impact of credit constraints on BAB he plots the 3-year rolling average of the US equity BAB and the inverse of the TED spread shown in the chart on the next page. Frazzini uses this as further evidence of the impact on BAB on credit tightening.

On the basis of their work, Frazzini concludes that the model predicts that
  1. Agents, such as hedge and private equity funds, with access to leverage buy low-beta securities and lever them up.
  2. Agents restricted by leverage constraints, such as mutual funds, prefer high-beta assets.

4. Innovative Efficiency And Stock Returns

David Hirshleifer, Professor of Finance, Merage Chair in Business Growth, Paul Merage School of Business, University of California, Irvine presented "Innovative Efficiency and Stock Returns," he coauthored with Po-Hsuan Hsu, Assistant Professor, School of Business, University of Connecticut and Dongmei Li, Assistant Professor, Rady School of Management, University of California, San Diego.

Hirshleifer points out that recent studies have provided evidence suggesting that, due to limited investor attention, prices do not fully and immediately impound the arrival of relevant public information. This is especially so when such information is less salient or arrives during a period of low investor attention. This insight into prices may be particularly relevant when looking at the link between innovative efficiency and subsequent stock returns, an important contributor to a firm's market value.

Hirshleifer and his colleagues test whether a measure of innovative efficiency, the ratio of a firm's patents to its R&D expenditure, predicts subsequent abnormal returns. There are several reasons why innovative efficiency should predict higher future returns:

1. *Limited Attention.* Innovations are usually officially introduced to the public in the format of approved patents that provide necessary detailed information. Firms that are more efficient in innovations may be undervalued and firms that are less efficient in innovations may be overvalued due to investor under-reaction to information. The problem may come from the difficulty in getting, understanding and processing patent information, and in determining the economic potential of innovative efficiency.

2. <u>*Q-Theories.*</u> Companies with higher innovative efficiency tend to be more profitable and have higher return-on-assets. All else equal, this implies that higher profitability predicts higher returns since a high return on assets suggests that these assets were purchased at a discount.

To test their key prediction (innovative efficiency predicts stock returns) Hirshleifer defines innovative efficiency (IE) as the ratio of the number of patents granted to five-year cumulative R&D expenditures. He says that the evidence supports the basic prediction of both the limited attention and *Q*-theories and finds a significantly positive relationship between innovative efficiency and future stock returns that are not explained by standard risk factor models. In fact the value-weighted return of the high innovation (IE) portfolio is 38 basis points per month higher than that of the low IE portfolio and the alphas of the high-minus-low IE portfolio range from 45 to 46 basis points per month. Moreover, the high-minus-low IE portfolio loads significantly and negatively on the market and size factors. This implies that high IE firms are less risky than low IE firms from the perspective of conventional risk factor models.

For their test they use a sample of firms in the intersection of Compustat, CRSP, and the NBER patent database from 1981-2006. The IE measure is based on R&D expenditures over the preceding five years that contribute to successful patent applications. Hirshleifer notes that the lag length between R&D expenditures and patent applications is hard to identify precisely. As a result, they consider alternative measures of innovation.

To examine the return predictability of IE, they sort firms into three groups (low, middle, and high) at the end of February based on the 33rd and 66th percentiles of IE measured in the previous year. The two-month lag between the granted year end and the time of portfolio formation is imposed to ensure that patent information was known to the public. The table on the next page provides the summary statistics for their sample.

	Rank of patent counts/R&D capital			
	Low	Middle	High	Missing
Number of firms	677	248	462	3323
Market capitalization ($million)	1294.03	4809.53	2764.99	798.25
% of total market capitalization	14.6%	19.9%	21.3%	44.2%
Patent counts/R&D capital	0.00	0.07	2.54	
Patent citations/R&D capital	0.01	1.21	48.34	
Citations excluding self-cites/R&D capital	0.01	1.10	45.11	
R&D expenditure ($million)	40.51	187.53	72.81	7.64
R&D expenditure/Market capitalization	0.09	0.11	0.07	0.04
R&D expenditure/Sales	2.78	2.54	0.60	1.75
Book-to-market ratio	0.75	0.70	0.67	0.85
Net stock issues	0.07	0.04	0.04	0.06
ROA (%)	−5.46	−0.04	−0.04	0.59
Asset growth	0.23	0.15	0.18	0.21
CapEx/Assets	0.08	0.07	0.07	0.10
Momentum	0.02	0.06	0.05	0.00
Institutional ownership (IO)	0.29	0.49	0.43	0.31

Hirshleifer then points out that the high IE group has the lowest R&D intensity, suggesting that IE is distinct from R&D intensity. The high IE group also has lower book-to-market ratio, higher ROA, lower CapEx/Assets, higher institutional ownership, and issues less equity than the low IE group. He then proceeds to describe the process they used in considerable detail.

In conclusion, Hirshleifer summarizes their findings:
1. Firms that are more efficient in innovation earn higher subsequent returns and the relationship is robust when controlling for other well-known firm characteristics. In addition, traditional empirical factor pricing models do not explain this relationship.
2. The innovative efficiency proxy (patents granted per dollar of R&D capital) is a strong positive predictor of future returns.
3. A model that combines the investment based three-factor model with the financing based mispricing factor (Undervalued Minus Overvalued) captures most of the innovative efficiency effect in the full and large firm subsample, but not in the small firm subsample.
4. Within the large firm subsample, explanatory power comes primarily from the ROA factor.
5. In the small firm subsample, explanatory power comes primarily from the misvaluation factor.

6. Proxies for investor inattention and valuation uncertainty are associated with the stronger ability of IE to predict returns. This provides support for psychological bias or constraints contributing to the IE-return relationship.

Hirshleifer concludes that these findings suggest that both risk and mispricing play a role in the IE-return relationship. More importantly, regardless of the source of the effect, the heavy weight of the EMI factor in the tangency portfolio suggests that innovative efficiency captures pricing effects above and beyond those captured by the other well-known factors.

5. Investment For Effect: Design For Undersea Warfare In The 21st Century

Rear Admiral Michael Yuring, Director of Strategic Planning and Communications for Submarine Warfare was the Monday evening dinner speaker. His topic was "Investment for Effect: Design for Undersea Warfare in the 21st Century."

Admiral Yuring began with an overview of naval resources. Submarines, he said are uniquely equipped to operate globally and unobserved. He provided a description of the resources currently in place and the Navy's planning for an uncertain future. Two things he covered were of particular interest: personnel and equipment.

He noted that the level of skill and physical condition of those willing to serve is not uniformly satisfactory and, to make the situation more challenging -- increasing technology requires greater education. In addition to a higher level of education, greater technical skills are needed as underwater drones are developed and deployed. Given the current state of the economy, recruiting recently has been easy with yearly quotas being met in the first 6 months of the year. As the economy recovers he does not believe this will continue. The Admiral reported that the Navy now is taking a proactive role in public schools to encourage the development of talent.

The current economic conditions are favorable for recruiting new members of the Navy, but are not conducive to new investment and expenditures. This is an evolving situation and all the services are working to contain costs and do careful planning, Yuring said. This cost cutting has resulted in increased cooperation between the services. The support the Navy receives ultimately depends on political decisions.

Admiral Yuring provided a review of the submarine services resources and its plans for the future. He specifically noted that building submarines has a long lead time and the new Virginia class submarines, when built, would be in service until 2080. This led to a discussion of the long-term planning process the Navy uses to anticipate needs in a changing world.

Yuring reminded us that the US military is not just about waging war, but about avoiding war, and discussed their cooperation with the State Department.

6. Demography Changes, Financial Markets And The Economy

Robert D. Arnott, Chairman **and Founder**, Research Affiliates, LLC presented "Demographic Changes, Financial Markets, and the Economy," a joint work with his colleague Denis Chaves.

Arnott starts by saying that we are about to be hit with a "Triple D Hurricane: Debt, Deficits and Demographics." All are important, but the first two are more immediate and more the subject of headlines. However, he says, it seems natural that the shifting composition of a nation's population ought to influence GDP growth and perhaps also capital markets returns. In this presentation he explores the role of changing demographics along the six linkages shown in the chart that follows.

Let's Explore Six Linkages!	Economic Growth	Stock Market Returns	Bond Market Returns
Demographic Profile Of a Nation / Economy	Nature of the Link?	Nature of the Link?	Nature of the Link?
Rate of Change of Demographic Profile	Nature of the Link?	Nature of the Link?	Nature of the Link?

As the baby boomers have aged, many people have studied past demographic data in an effort to extract indications for their future influence on many aspects of the economy. Arnott says before his work with Chavez there were some interesting results, but none with sufficient statistical significance.

To lead into the presentation he shows cohorts grouped by age over time in various countries. These charts show past and impending demographic changes and clearly demonstrate the shifting ages in a country's population. Japan, well known to be an aging population, is only one of many countries where the population's age distribution is changing. The current situation and the coming changes are clear, but what is important for Arnott is what these shifts do to the country's economy, its economic growth and its financial markets.

He analyzes the effect of demographic changes on three measures of great importance for countries all over the world: real per capital PPP adjusted GDP growth, stock market excess returns, and bond market excess returns. On the basis of this work he can confirm what others have already demonstrated: a growing roster of young adults (age 15–49) is very good for GDP growth, growth of older workers is a little bad for GDP growth and a growing roster of young children or senior citizens is very bad for GDP growth. The use of a polynomial curve-fitting technique allows them to do so with statistical significance.

He spells out the demographic, GDP and GDP growth relationships:
1. GDP per capita growth.
    a. Highest GDP growth is associated with young adults 20-39.
    b. Late teens and the younger middle-age population help GDP growth a bit.

     c. The transition period for those in the 50-55 cohort goes from helping to hurting GDP growth.
     d. Young children hurt GDP growth a little.
     e. Senior citizens hurt GDP growth a lot.

2. Stocks perform better when:
     a. There are many in the 35 - 59 age group, but worse when there are many senior citizens or children.
     b. The 45-64 group is growing faster, but worse when the young adult or the 70+ age group are growing the fastest.
3. Demography affects bonds about a 5-year age difference, but with greater statistical significance.

Two notions guide the research design:
1. PPP adjusted real GDP growth adjustment creates a fairer global comparison by focusing on the domestic purchasing power of the average citizen for the consumption basket that is more appropriate for each country than GDP.
2. Stock and bond returns are measured as excess returns relative to domestic cash returns rather than as simple annualized returns. This strips out inflation differences and allows for fair comparisons around the world.

Arnott reports that these steps lead to some simple and compelling demographic curves that conform nicely to intuition about how people behave at various stages in their lives. He presents pairs of graphs showing the relationship between demographics and demographic rate of change with GDP growth, returns from stocks and from bonds. All are intriguing. The one that relates GDP growth to demographic share is shown below. The role of the various age cohorts is clear. What he calls the "sweet spot," near the top of the curve, shows the group that has the highest impact on GDP growth.

GDP Growth and Demographic Shares
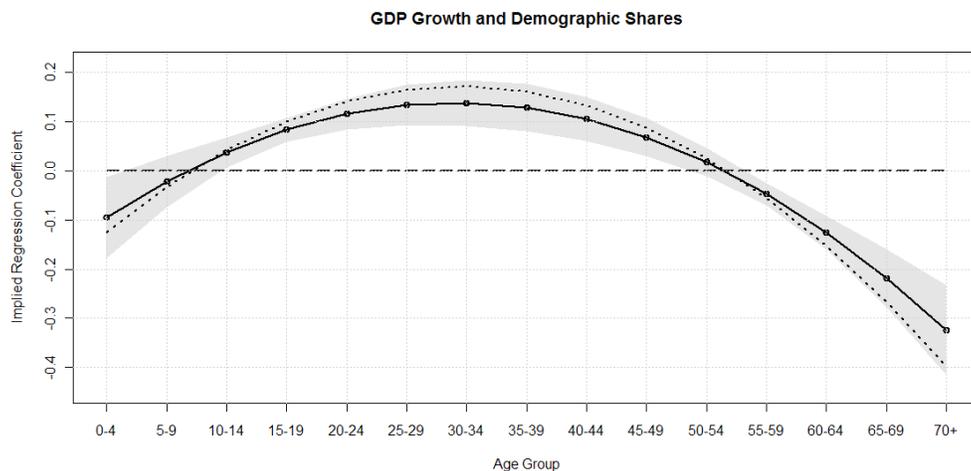
He then shows relationship between stock returns and bond returns and demographic composition.

Arnott takes his findings and develops three global forecasts based on demographic composition: a forecast for 2011-2020 GDP growth based on demographic composition; forecasts for bond and; for stock returns for the same period. The forecast for GDP growth and that for stock returns are shown below.
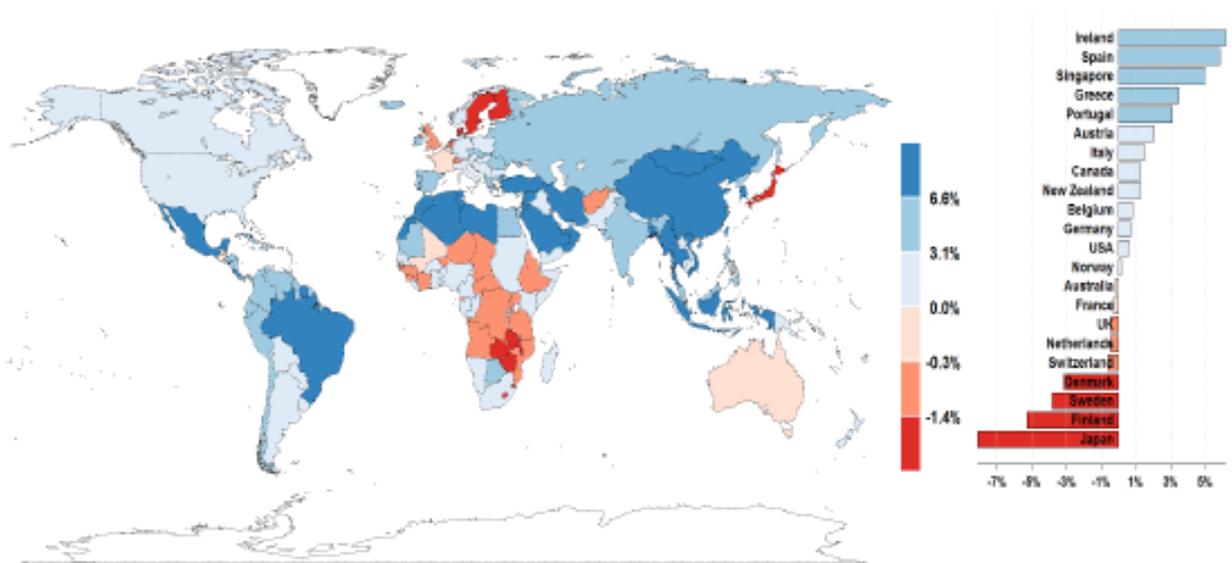
These forecasts for the next 10 years are what Arnott calls, sobering.

Arnott concludes that what he learned is unsurprising, except in its statistical significance and in the tacit implications for the years ahead. He says their research shows:
1. A strong link between demographic shares (or demographic changes) and:
   a. Per capita real GDP growth.
   b. Stock excess returns.
   c. Bond excess returns.
2. Polynomials are a powerful and intuitive way to understand these relationships.

7. What Does Equity Orderflow Tell Us About The Economy?

Michael W. Brandt, Kalman J. Cohen Professor of Business Administration, Duke University and NBER presented "What Does Equity Sector Orderflow Tell Us about the Economy?" he coauthored with Alessandro Beber, Amsterdam Business School, University of Amsterdam and CEPR, and Kenneth A. Kavajecz, Associate Professor of Finance, Madison School of Business University of Wisconsin – Madison.

Investors rebalance their portfolios as their views about expected returns and risk change. In this paper Brant uses empirical measures of portfolio rebalancing to back out investors' views, specifically their views about the state of the economy. His focus is on orderflow, the act of initiating the purchase or sale of securities, not price or returns.

Orderflow, Brandt says, is the conduit through which information about economic fundamentals are aggregated into asset prices. Asset prices help forecast business cycles and orderflow is the mechanism by which asset prices change. This raises the question, Brandt says, of how orderflow is related to current and future economic conditions and whether it contains less, the same, or more information than prices or returns. Orderflow contains:
1. Less information if a substantial portion of the price formation process is due to unambiguous public information resulting in instantaneous price adjustments.
2. The same information if it simply passes through to asset prices.
3. More if unique information relative to prices is not fully incorporated in them but is passed through investors' trading behavior.

The latter is possible if, Brandt says, orderflow represents actions of investors while returns reflect consequences.

There are many different ways to investigate these issues, just as there are many strategies investors use to adjust their portfolios in response to changes in their views about economic fundamentals. In this research Brandt and his colleagues focus on sector rotation, a highly publicized investment strategy that exploits differences in the relative performance of sectors at different stages of the business cycle. Specifically they analyze the dynamics of orderflow across ten U.S. equity sectors to determine whether sector-based portfolio adjustments are related to the current and future state of the macro economy and the aggregate stock and bond markets. As a result of the research, Brandt says they find that:
1. Sector orderflow movements predict changes in the expansion/contraction index and the future performance of the bond markets.
2. Orderflow contains more and different information when compared to such things as returns.
3. The nature of the information is common across markets.
4. There is a line between this information and the macro economy as seen through its relationship to non-farm payroll announcements.
5. Their results are stronger when orderflow is less dispersed within sectors. This lends further support to the conjecture that the sector orderflow measures reflect the

empirical foot-prints of broad sector rotation rather than stock-picking within particular sectors.

6. The correlation between active sector orderflow and mutual fund flows in core categories suggests to Brandt that orderflow measures are indeed capturing institutional trader flows.
7. Orderflow contains asymmetric information: it is primarily defensive in nature and largely related to wealth preservation.

To reach these conclusions, Brandt creates equity orderflow data constructed using the Trades and Quotes (TAQ) dataset over the sample period 1993 through 2005 and combines it with stock market data. After constructing the basic sector and stock market level–net orderflow-measures, they define passive and active measures:

1. Passive orderflow is defined as the total net orderflow to the stock market multiplied by the weight of that sector in the market portfolio.
2. Active net orderflow for each sector is the difference between sector level total net orderflow and passive net orderflow.

Examining the data Brandt reports that they find the percentage of orderflow across years remains fairly stable, although there are variations that occur, particularly leading up to and during the economic downturn in 2000. Further, the shifts in the shares of orderflow across sectors appear more pronounced for large orders and suggest that market participants placing large orders may be more aggressive and/or savvy in positioning their portfolios ahead of changes in the economy.

When their data is sorted into sectors chosen by their cyclicality with the U.S. business cycle, they find that the aggregate portfolio rebalancing across equity sectors is consistent with sector rotation, an investment strategy that exploits perceived differences in relative performance at different stages of the business cycle. The empirical foot-print of sector rotation, he says, has predictive power for the evolution of the economy and future bond market returns, even after controlling for relative sector returns. Contrary to many theories of price formation, trading activity therefore contains information that is not entirely revealed by resulting relative price changes.

As to the link of orderflow to the economy, they examine whether sector orderflow has predictive power for the Chicago Federal Reserve Bank National Activity Index (CFNAI) expansion indicator. Intuition suggests to Brandt that pro-cyclical (counter) sectors would have positive (negative) coefficients. What they find is that active orderflow of large orders into the material sector predicts higher levels of the expansion index both one and three months ahead. Conversely, active orderflow of large orders into financials, telecommunications and consumer discretionary predicts lower levels of the expansion index at the one and three month horizons. It is interesting to note, he says, how pro-cyclical sector orderflow tends to lead the economy while the reverse is observed for counter-cyclical sectors.

After investigating the relationship between the expansion index and sector, they turn to an analysis of the cross-section of orderflow. Specifically, they are interested in determining the orderflow factor (i.e. the set of sector loadings) with the highest correlation to the state of the macro economy. Based on this, Brandt says, it is clear that the link between aggregate sector orderflow and the macro economy is strong, with large-sized active orderflow in specific sectors forecasting expansions/contractions up to one quarter ahead. In addition,

1. Large-sized sector orderflows, likely to originate from institutional investors, appear to contain the bulk of the predictive power in aggregate orderflow.
1. Target sectors for trading on the macro economy are consistent with common financial wisdom concerning sector rotation and portfolio allocation tactics: positive coefficients for pro-cyclical sectors; negative coefficients as sectors become more counter-cyclical.

Brandt does address whether prices/returns contain the same information as orderflow. He discusses their approach to examining this question and their tests before concluding that active net orderflow provides more and materially different information than that contained in returns and traditional low frequency market variables and contains information about the near term performance of the equity and bond markets.

As for practicality, when Brandt and his coauthors translate sector orderflow movements into tilts to the market portfolio and produce an orderflow mimicking portfolio, they find that it has superior risk and return properties relative to both the traditional market and to industry momentum portfolios. This is because, he says, orderflow contains asymmetric information that it is primarily defensive in nature and largely related to wealth preservation.

In the discussion that ensued, Brandt was asked about whether the results held up during the Financial Crisis. He said they did not.

8. The Other Side Of Value: Good Growth And The Gross Profitability Premium

Robert Novy-Marx, Assistant Professor, Simon Graduate School of Business
University of Rochester presented "The Other Side of Value: Good Growth and the Gross Profitability Premium."

Novy-Marx starts with the proposition that that gross profitability is a powerful predictor of the cross-section of average returns and is a much stronger predictor than earnings or free cash flows. He says gross profitability,

1. Has about as much power as the book-to-market (B/M) ratio and is complementary to it.
2. Is negatively correlated with B/M and helps distinguish high return "good growth" stocks from those with ordinary growth.

He then turns to a discussion of why gross profitability matters:
1. Gross profit is the "cleanest" measure of true economic profitability: earnings are punished for growth-related activities such as R&D and the development of organizational capital.
2. Free cash flows are further "punished" for capital investment even when they are optimal.
3. Gross profit predicts economic growth, even after controlling for valuations. Novy Marx calls it another dimension of growth.
4. Gross-profits-to-assets predict growth in gross profits, earnings, cash flows, dividends and repurchases.

To provide a strong test he uses stale data: end of year or fiscal year data six months after its publication. He does test high frequency data: data published most recently. Novy Marx says that that incorporating gross profits, whether lagged or high frequency, is a powerful predictor of the cross section of average returns. It appears, though, that the data is obscured by its negative correlation with book-to-market. In fact, after sorting on book-to-market it appears that profitable stocks underperform.

These results and others, Novy-Marx says, are difficult to reconcile with popular explanations of the value premium. Profitable firms are less prone to distress, have longer cash flow durations, and lower levels of operating leverage. Controlling for gross profitability explains most earnings related anomalies as well as a wide range of seemingly unrelated profitable trading strategies.

9. Why Bank Equity Is Not Expensive

Anat R. Admati, George G.C. Parker Professor of Finance and Economics , Graduate School of Business, Stanford University presented "Fallacies, Irrelevant Facts, and Myths in the Discussion of Capital Regulation: Why Bank Equity is *Not* Expensive," she coauthored with Peter M. DeMarzo, Mizuho Financial Group Professor of Finance Graduate School of Business, Stanford University, Martin F. Hellwig, Max Planck Institute for Research on Collective Goods, and
Paul Pfleiderer, C.O.G. Miller Distinguished Professor of Finance, Graduate School of Business, Stanford University.
Admati begins with the motivation for this presentation: the 2007-2008 Financial Crisis and its cause. She asks, "Was it mainly (or just) a liquidity problem, a run that affected a wonderful but inherently fragile modern banking system, or the result of excessive leverage and risk, and distorted incentives?" This basic question leads to others:
1. Can a large financial institution "fail?" Can bankruptcy or regulation be made to work? Entwined in this question is whether banks are too big/interconnected/important to fail or be allowed to fail.
2. What is systemic risk and what are systemically important financial institutions?

3. What are the costs and benefits of regulation? She points out that health and safety issues arise in other regulated industries: airlines, medicine, environment, nuclear plants. Should financial institutions be included in this group?

Admati uses a quote from a November 20, 2009, interview with Josef Ackermann, CEO of Deutsche Bank, to illustrate the crux of the bank equity tradeoff.

> More equity might increase the stability of banks. At the same time, however, it would restrict their ability to provide loans to the rest of the economy. This reduces growth and has negative effects for all.

She then edits it to show the "real deal." (Her additions are shown in underlines and deletions by strikethroughs.)

> *Well-designed capital regulation that requires much* more equity, ~~might~~ *will* increase the stability of banks. At the same time, ~~however~~, it would ~~restrict~~ *enhance* their ability to provide *good* loans to the rest of the economy *and remove significant distortions*. This *may* reduce~~s~~ *the* growth *of banks. However, it* ~~and has~~ will have positive effects for all *(except possibly bankers).*

Admati says that there is a pervasive sense in discussions of bank capital regulation that equity is expensive and that higher equity requirements, while beneficial, also entail a significant cost. The arguments she and her coauthors examine are those most often made in this context and are, what she calls, fallacious, irrelevant, or very weak. Admati continues that their analysis leads them to conclude that requiring banking institutions to be funded with significantly more equity entails large social benefits and minimal, if any, social costs. She provides the following arguments made against high equity requirements and explains why they are either incorrect or unsupported:

1. **Increased equity requirements would force banks to "set aside" or "hold in reserve" funds that can otherwise be used for lending**. To this she says there is no immediate relationship between liquidity requirements and capital requirements: capital requirements refer to the mix of debt and equity used to fund banks; liquidity or reserve requirements relate to the type of assets and asset mix banks must hold. Since they are two different sides of the balance sheet, there is no immediate relationship between them.

2. **Increased equity requirements would increase banks' funding costs because equity requires a higher return than debt**. This, Admati says, is a fallacious argument. Instead, she says, required return on equity, which includes a risk premium, must decline when more equity is used. Any argument or analysis that holds fixed the required return on equity when evaluating changes in equity capital requirements is fundamentally flawed.

3. **Increased equity requirements would lower the banks' return on equity (ROE) and result in a loss in value.** Fallacious, she says. The expected ROE of a bank increases with leverage and would thus indeed decline if leverage is reduced. One exception is when increased leverage brings more government subsidies.

4. **Increased equity requirements would increase banks' funding costs because banks would not be able to borrow at the favorable rates created by tax shields and other subsidies.** It is true, Admati says. Through taxes and underpriced explicit or implicit guarantees, debt financing is subsidized and equity financing is effectively penalized. Policies that encourage high leverage are distorting and paradoxical because high leverage is a source of systemic risk. The subsidies come from public funds. If some activities performed by banks are worthy of public support, subsidies should be given in ways that do not lead to excessive leverage.

5. **Increased equity requirements would be costly since debt is necessary for providing market discipline to bank managers**. In theory, Admati says, debt can sometimes play a disciplining role, but the arguments for lenders as disciplinarians are weak. Instead,
   a. High leverage actually creates many frictions including incentives for banks to take excessive risk.
   b. There is little or no evidence that banks' debt holders provided any significant discipline during the Financial Crisis,
   c. The argument ignores the potential disciplining role that can be played by equity shareholders or through alternative governance mechanisms.
   d. The discipline provided by debt generally relies upon a fragile capital structure funded by short-term debt that must be frequently renewed.
   e. There must be less costly ways to solve governance problems.

6. *Increased equity requirements would force or cause banks to cut back on* **lending and/or other socially valuable activities.** Admati counters this saying that higher equity capital requirements do not mechanically limit banks' activities. Any "debt overhang" problem can be alleviated if regulators require undercapitalized banks to recapitalize quickly by restricting equity payouts and mandating new equity issuance. Once properly capitalized, Admati points out, banks would make better lending and investment decisions and issuance costs would be reduced.

7. **The fact that banks tend to fund themselves primarily with debt and have high levels of leverage implies that this is the optimal way to fund bank activities.** There is no logic to this argument, Admati says. Just because financial institutions choose high leverage does not mean this form of financing is optimal. Rather, it means that the observed behavior is the result of factors unrelated to social concerns, (e.g. tax incentives and other subsidies), and to frictions associated with conflicts of interests and to an inability to commit in advance to certain investment and financing decisions.

8. **High equity requirements will drive banking activities from regulated to unregulated sectors and would thus be ineffective or even harmful.** First, in the run-up to the crisis, many activities and entities in the so-called "shadow banking system" relied on credit backstops and other commitments made by regulated entities. Thus, these activities and entities were, and continue to be, within regulators' reach. Second, defining the entities and activities that should be regulated will always be a challenge. It is far from clear that, given the tools already and potentially available to lawmakers and regulators, the challenge of effective capital regulation cannot be met.

Admati provides the following recommendations:
1. Since bank equity is not expensive, regulators should use equity requirements as a powerful, effective, and flexible tool with which to maintain the health and stability of the financial system.
2. Regulators should use restrictions on equity payouts and mandate equity issuance to help banks. This will assure that they maintain adequate and high equity capitalization.
3. If certain activities of the banking sector are deemed to require subsidies, then subsidies should be given in ways that alleviate market frictions and not through a system that encourages high leverage.
4. Better resolution procedures for distressed financial institutions, while necessary, should not be viewed as alternatives to having significantly better capitalized banks.
5. Higher equity requirements are superior to attempts to fund bailouts through a "bailout fund" supported by bank taxes.
6. Approaches based on equity are superior to those that rely on non-equity securities such as long term debt.

To conclude Admati says after the Financial Crisis, the burden of providing a compelling argument for why high leverage of banks is justified must be on those making the claim. Policy should not be made on the basis of fallacious claims and must be based on social costs, benefits and solid reasoning. Finally, she asks, "Why do investors/shareholders allow banks to lobby against sensible regulations using flawed claims?"

10. Institutional-Quality Hedge Funds

David Hsieh, Bank of America Professor, Fuqua School of Business Duke University concluded the Fall 2011 Q-Group meetings by presenting "Institutional-Quality Hedge Funds."

Hsieh is interested is in hedge funds and their returns and poses the question," What is the experience of the average dollar invested in hedge funds?" To answer that question he says he needs a market portfolio of hedge funds: asset weighted hedge fund returns like the CRSP VW index. Since hedge funds are private that data is neither available nor is it incomplete. Even such data as assets under management are incomplete. It is the data problem that is the subject of this presentation.

Hsieh's first task is to create a useable hedge fund database from both public and private sources. There are 2608 firms from public source firms that provide 94% of his data. Using this data base, he provides information final data set he creates. He says that there has been significant growth in the institutional use of hedge funds. Furthermore, the very largest hedge funds dominate the assets under management in the industry.

When examining the firms by assets under management (AUMs) he finds that large firms manage more than 80% of the assets, survive longer, tend to stay in the sample longer and have lower entry and exit rates.

He sorts his data by deciles and finds that:
1. Excess return, alpha and the Sharpe Ratio, have a U-shaped pattern across the deciles.
2. Large firms have less equity and more credit spread exposure.
3. Equity risk is lower in a bear market.
4. All funds have emerging markets exposure.

Hsieh then turns to what he calls an S&P-like hedge fund analog, Institutional Quality (IQ) firms: 8-10% of the sample number of firms that manage 60-75% of the AUMs. Over the past decade:
1. These IQ firms grew continuously until 2008.
2. Their AUMS outgrew those from smaller firms.

As for the data base created by Hsieh, he says that there is good and bad news:
1. The good news is that
   a. Adding the approximately 100 mega firms to the data greatly increases the industry AUMs.
   b. Reporting and non-reporting firms of similar size have similar survival/performance characteristics.
   c. An AUM weighted portfolio of IQ firms provides a good proxy for the market portfolio of hedge funds and only requires collecting data from a manageable number of non-reporting firms.
2. The bad news is that
   a. Commercial data bases contain a declining share of total industry AUMs.
   b. Survival and performance data vary across firm size, thus making any weighting scheme relevant.

Finally, the best news, an asset-weighted portfolio of IQ firms provides a good proxy for the market portfolio of hedge funds and only requires collecting data from a manageable number of non-reporting firms.

11. Diversification Over Time

Barry Nalebuff, Milton Steinbach Professor, Yale University School of Management presented "Diversification Across Time," he coauthored with Ian Ayres, William K. Townsend Professor, Yale University Law School was the last presentation of the Fall 2011 Q-Group.

Nalebuff starts with the motivation for this research, a quote from Paul Samuelson (1969)

> [The businessman] can look forward to a high salary in the future; and
> with so high a present discounted value of wealth, it is only prudent for

him to put more into common stocks compared to his present tangible
wealth, borrowing if necessary for the purpose.

Based on their work, Nalebuff comes to the following conclusion: buy stocks using leverage when you are young. He provides the following example to make the reason clear. A person has two choices, a fund that allocates:
1. Seventy-four percent of the initial portfolio to equities and the remainder to government bonds, or a
2. Leveraged lifecycle fund that begins by allocating 200% of the initial portfolio value to stocks ramping down to 50% as the person nears retirement.

Instinctively, he says, most people feel that the leveraged strategy is riskier since it starts with the higher proportion of the portfolio in equities and is levered. What they do not factor in is that the leveraged strategy ends with a lower stock allocation at a point when the absolute size of the portfolio is larger.

Using historical stock returns (from 1871 through 2009) Nalebuff demonstrates that with identical mean returns for the two strategies the 74% strategy has lower volatility. The result comes from the leveraged lifecycle strategy's lower standard deviation. This results in a strategy with lower volatility that better diversifies the stock risk exposure across time with no loss of return.

To assess the two strategies Nalebuff and his coauthor use simulation to examine a worker's 44-year experience in the markets spanning the period from 1871 through 2009. Each group, cohort of workers, begins working at age 23 and retires at 67. The first cohort of workers was born in 1848, started work in 1871 and retired in 1915. The table on page 24 provides strong evidence that a leveraged lifecycle strategy can reduce retirement risk: the 200/50 strategy has a 21% lower standard deviation in the retirement accumulation.

Table III: Comparison of Alternative Investment Strategies Based on Optimal Investment Targets on Monthly Data			
	200/50 Strategy	74/74 Strategy	Improvement of 200/50 over 74/74
Max % inv.	200%	74%	
Min % inv.	50.0%	74%	
Mean	$738,684	$738,684	0.0%
St. Dev.	$192,720	$242,833	-20.6%
Min	$299,208	$306,060	-2.2%
10th pct	$478,734	$440,792	8.6%
25th pct	$621,543	$552,661	12.5%
Median	$747,344	$686,328	8.9%
75th pct	$871,931	$914,909	-4.7%
90th pct	$981,637	$1,128,575	-13.0%
Max	$1,166,663	$1,229,855	-5.1%

Note: 74/74 strategy obtained by equilibrating mean return for target strategy with that of constant percentage strategy

Nalebuff says there are several reasons the leveraged approach is superior. It:
1. Reduces volatility by having higher lows and lower highs.
2. Is better diversified because it spreads the exposure to stocks across time.
3. Channels all the incremental benefits of better temporal diversification to risk reduction.
4. Brings the investor closer to their utility-maximizing allocation: the improvement in the certainty equivalent of retirement wealth is between 35% and 39%.

As to the impact of major market declines on their results, there are two concerns: losses and the impact of potential margin calls. As for losses, he says that in their monthly data, the stock market never declined sufficiently to wipe out the preexisting investments of any retirement group they studied when that cohort adopted a leveraged strategy. To test for the impact of margin calls, they perform a reality check by examining the results for groups who lived through the depression years. Nalebuff reports that workers who retired just after the crash were not severely hurt because the leveraged strategy had already eliminated their leverage: workers retiring in 1932 would have had 50% of their portfolio invested in the market when the market lost more than a third of its value. However, because of the success of their investments in previous years they still would have accumulated a retirement wealth greater than if they had used the constant percentage strategy.

Nalebuff reports on their robustness checks before turning to his conclusions.
1. The data supports that the Samuelson-Merton notion that people with constant relative risk aversion should invest a constant percentage of their lifetime wealth each period in stock.
2. Young workers require leveraged to implement the strategy.
3. Their recommended investment strategy is simple to follow.

4. The potential gains of risk reduction from such leveraged investments are striking.

Nalebuff points out four important points. First, their estimation does not take into account the impact of non-portfolio wealth such as housing and human capital. The relevance of this issue will vary across professions and he suggests that all investment strategies, including target-date funds, should be different by profession thus reflecting the different indirect exposure to equities via human capital.

Second, their estimation also does not take into account the potential general equilibrium effects that might occur if a substantial segment of investors began adopting leveraged lifecycle strategies. Nalebuff moderates that concern by pointing out that, as a historical matter, economies have successfully adapted to leveraged investments in both housing and education.

Third, their results have implications for legal reform. The natural places to engage in disciplined leveraged purchases are in IRA and 401(k) accounts. Yet, with the exception of the index options, other leveraged and derivative investments inside these accounts are prohibited. What mitigates this possibility is the fact that an employer who offered workers the option of investing in a fund that implements a leveraged strategy might risk losing its statutory safe harbor.

Fourth, Nalebuff recognizes that legal constraints are not the primary reason that people fail to buy enough stock when they are young. Despite compelling theory and empiricism, many people have a strong psychological aversion to mortgaging their retirement savings. While families are encouraged to buy a house on margin, they are discouraged and/or prohibited from buying equities on margin. We are, he says, taught to think of leveraged investments as having the goal of short-term speculation rather than long-term diversification. As a result, most people have too little diversification across time and too little exposure to the market when young. Based on theory and historical data, the cost of these mistakes, Nalebuff says, is substantial.

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