

Research Statement
Ron Kaniel
December 2010

I. Research

Overview

To provide a parsimonious description of highly complex markets, financial models frequently make simplifying assumptions, but failures of these models has motivated researchers to relax assumptions on various dimensions. Some ‘relaxations’ are more challenging than others, such as allowing for the interplay between market participants. However, these more challenging ‘relaxations’ are precisely the ones that could matter the most in improving our understanding of capital markets. I study how market imperfections and the incentives of intermediaries in financial markets (such as fund managers) impact portfolio choice decisions and affect asset prices. I address both partial and general equilibrium implications, using both positive and normative approaches.

Within this general framework, my main contributions have been in the following three areas:

Relative Wealth Considerations: Financial models often assume that individuals are motivated solely by concerns about their own wealth, and are unaffected by the wealth of others. Where prior literature has taken relative considerations into account, it has departed from the standard paradigm by injecting relative considerations directly into the utility function (for example, agents are assumed to care how wealthy they are compared to their peers).

In my work, I have maintained “standard” utility functions that depend only on one’s own consumption, and have shown that relative wealth concerns can arise endogenously through price effects in fully rational general equilibrium models with limited participation. My insight is intuitive: investors care about other agents’ wealth because it impacts the prices of goods they consume. I have shown that these endogenous price effects can lead to herding in portfolio choices that, in turn, leads to a powerful mechanism that can help explain (resolve) major empirical regularities (puzzles) such as home/local bias, dynamic asset pricing bubbles, and excessive investment in high risk technological innovations—all of which represent major puzzles in standard models.

The success of my work in helping explain these puzzles highlights the importance of considering models with heterogeneous agents and the limitation in assuming identical agents. If agents are identical, a representative agent characterization will prevail, prices will be determined by aggregate fundamentals, and no distortions will exist in equilibrium.

Portfolio Delegation - the Impact of Incentives: In standard asset pricing theory investors are assumed to invest directly in financial markets. The role of delegated money managers and the corresponding agency problems are ignored. However, delegated portfolio management is a multi-trillion dollar industry, with the proportion of US equity held by mutual funds, pension funds and hedge funds together exceeding 45 percent. With such a high proportion held by actively managed funds, clearly there is a potential for managers' allocation decisions to impact asset returns. In my research I have provided both new theoretical insights on the impact of inherent incentives in the delegated portfolio management industry on funds' portfolio allocations and consequently equilibrium prices, as well as empirical evidence showing how these incentives distort portfolio allocations and asset prices.

Using a dynamic general equilibrium framework, I have analyzed the impact of different commonly used fee structures in the money management industry on stock return dynamics, in a setting where contract parameters, the extent of delegation and equilibrium prices of both benchmark and non-benchmark securities are all determined endogenously. I have shown that the presence of delegation can have a profound impact on asset prices. Specifically, I can discriminate between the impact on asset prices of contracts used in the mutual fund industry from those used in the pension and hedge fund industries. My work helps explain, for example, why a stock's price increases (decreases) as it is added to the S&P500 index, a well-established empirical regularity, and provides a rationale for the use of asymmetric performance fees.

Analyzing the impact of implicit dynamic incentives, I have shown that the well established convex relation between past fund performance and future flows can have dramatic implications in equilibrium for fund trading strategies, as well as price dynamics. My work establishes an important and novel equilibrium link between the share of capital delegated to financial intermediaries, and the size of repo and futures markets; all three have experienced sharp increases in recent decades. I have show that increased share of delegation leads to increased heterogeneity in trading strategies of fund managers with similar incentives, so that in equilibrium identical managers trade among themselves, leading to a significant increase in the size of the repo and futures markets.

Analyzing the impact on managers' portfolio choice decisions of incentives induced by the fact that investors may dynamically shift money in and out of funds, I have identified and analyzed distortions to funds' portfolios that emanate from the desire to hedge future investors' flows. I have shown that these distortions can induce an increasing relation between fund flows and lagged returns, consistent with empirical evidence, even with complete information.

On the empirical front, I have presented compelling evidence that top performing equity fund managers respond to incentives to move returns between periods, incentives induced by the established convex relation between net new investment and performance. They do so by marking up their holdings at quarter-end through aggressive last-minute trading

of stocks they already hold. As a result, quarter-end prices of equity funds are significantly inflated.

While delegation is an important channel that impacts portfolio allocations, there are other important domains where incentives related to market frictions can have significant implications for portfolio choice. Studying incentives induced by capital gains taxes I have shown that investors may obtain significant utility gains by shorting some stocks even when there are no embedded gains, as an ex-ante way of minimizing future tax-induced trading costs.

Trading and Return Predictability: The semi-strong form of the efficient market hypothesis predicts that publically available information, such as trading volume, should not have predictive power for returns over and above an appropriate measure of risk. My work on trading volume and order flow highlights the value of information contained in extreme trading volume for predicting subsequent returns, and proposes that market imperfections play an important role in explaining the predictive role of trading volume. I identify the presence of a *high volume return premium* whereby stocks that experience unusually high (low) trading volume over a week, or even just a day, tend to appreciate (depreciate) over the course of at least the following month. I link this premium to Merton's (1987) investor recognition hypothesis, which relates the size of the investor base to a stock's expected returns.

I have also shown that stocks exhibit significant high (low) excess returns in months that follow a week of intense buying (selling) by individuals. Combined with the fact that individual investors are contrarian in the short run, this implies that the pattern I have identified is consistent with the idea that risk-averse individuals provide liquidity for institutional traders that value immediacy (i.e., quick execution of trades). The idea that individual investors get compensated for providing liquidity is novel, provocative, and in stark contrast to the proverbial "noise trader" role that is typically attributed to them. Furthermore, focusing on trades of individual investors prior to earnings announcements I have provided evidence supporting the hypothesis that individuals may not only get compensated for providing liquidity but on aggregate may also possess useful information about future stock returns that is not incorporated into the stock price prior to the announcement. This evidence is even more at odds with their commonly assumed proverbial "noise trader" role, suggesting we should potentially re-evaluate individual investors' role in financial markets.

In my work on price drift I challenge the common perception that slow aggregation of heterogeneous information can lead to emergence of a price drift in a 'Rational Expectations Equilibrium'. I show that slow aggregation of information is, however, a viable channel for creating price drift within a 'Difference of Opinions' setting, where agents 'agree to disagree'. I also propose and test a simple mechanism that reveals that what some have argued is mechanical trend chasing behavior by mutual funds may in fact represent trading by privately informed investors.

My current finance related research portfolio consists of 14 papers that are published or forthcoming, four completed working papers, and two additional projects that are in progress. Of the four working papers, one is under second round review and one is under revision for second round resubmission. The remainder of this section discusses these 20 papers in more detail, organized by topic, as well as a discussion of the future direction of my research.

Relative Wealth Considerations

Financial models often assume that individuals derive utility solely based on their wealth. Despite this fact, there is a fair amount of evidence that relative considerations have a significant impact on our utility. For example, some would argue that the utility derived from driving a shiny new Lexis differs depending on whether one's neighbor is driving an old Honda Civic or just bought a new and even shinier Lamborghini. Personally, I would probably agree. In a series of papers, Peter Demarzo, Ilan Kremer, and I study the implications of relative wealth considerations for asset pricing and portfolio choice. Our work is innovative and important because we show how relative wealth considerations can arise endogenously in standard, fully rational equilibrium models. While agents care only about their own consumption, relative wealth concerns arise as a pecuniary effect, by impacting prices of consumption goods.

We emphasize a general equilibrium approach, because it allows us to examine whether such relative effects impact the equilibrium outcome through some form of aggregation. This approach highlights the fact that agents need to be divided into separate groups or communities in order to get non-trivial implications. This implies that agents do not use the same benchmark when evaluating their wealth. If agents are identical, a representative agent characterization will prevail, prices will be determined by aggregate fundamentals and no distortions will arise. The equilibrium analysis also points to 'herding' as a crucial ingredient in obtaining an aggregate effect.

Our first paper, **“Diversification as a Public Good: Community Effects in Portfolio Choice”** (*Journal of Finance*, 2004), shows how relative wealth concerns lead to a novel and intuitively appealing explanation for the “home bias puzzle,” or, more generally, for the locality and lack of adequate diversification of investments by individual investors. We find that competition for local resources (such as local real estate, labor and other services) creates an externality causing individuals to care about their relative wealth in the community. This in turn leads to an externality in portfolio choice. If local resources cannot be fully collateralized and investors are sufficiently risk averse, then individual investors will bias their portfolio choice in the direction of the aggregate portfolio choice of the community. We show that this leads to an equilibrium in which individuals in each community hold undiversified portfolios that are correlated within the community. This induces a type of “community risk,” implying that financial integration may result in a welfare loss to all agents. The analysis also leads to important policy implications. For example, there may be a role for social policies that subsidize investor diversification.

The paper was nominated for the Smith Breeden Prize as best paper published by the *Journal of Finance* in 2004.

In our first paper, in order to focus on implications for portfolio choice, we did not consider price effects and dynamics. However, in more recent work we show that relative wealth concerns have important implications for prices as well. In **“Relative Wealth Concerns and Financial Bubbles”** (*Review of Financial Studies*, 2008), we demonstrate how endogenous relative wealth considerations can play a role in explaining the presence and dynamics of financial bubbles. We derive a dynamic, fully rational overlapping generation model (OLG) with finite horizons in which bubble-like price behavior arises in equilibrium. Our results are surprising given that agents have finite lives, are rational, and consequently use backward induction to make portfolio choices. However, the endogenous desire to hedge the risk of being different from the rest of the cohort leads agents to herd in their portfolio choice. As the bubble expands, the wealth of the cohort increases, causing hedging incentives and price distortions to grow over time. While agents anticipate that the bubble is highly likely to burst, thereby leading to substantial losses, they are afraid to trade against the crowd because of relative wealth considerations. We show that bubbles can emerge as long as relative wealth concerns are sufficiently strong, and there is sufficient heterogeneity across agents’ preferences.

Our work also contributes to the understanding of what general properties are required from a utility function in order for herding incentives at the individual level to aggregate and lead to herding behavior and price distortions in equilibrium. While we focus on relative considerations that arise endogenously, the existing literature has examined exogenous specifications, such as *Keeping up with the Joneses* preferences. By definition, the marginal utility of an agent with *Keeping up with the Joneses* preferences is increasing in average community consumption. This leads agents to have an incentive to induce a positive correlation between their portfolio and the portfolios of others in their community. However, we demonstrate that *Keeping up with the Joneses* preferences are not sufficient for the creation of price distortions and/or herding in equilibrium. In order to support herding and distortions in equilibrium, the *Keeping up with the Joneses* motive needs to be sufficiently strong such that it outweighs investors’ risk aversion, a property we term *Herding*.

There is an extensive literature that models financial bubbles using other frameworks. One ingredient that is missing from many of these papers is an explanation for why such behavior seems to be triggered by the introduction of a new risky technology. Important examples of this are telecom in the 1990’s, or Britain’s “railway mania” surrounding the advent of the railway industry in the 1845. We address this issue in **“Technological Innovation and Real Investment Booms and Busts”** (*Journal of Financial Economics*, 2007), where we examine a production economy that has similar features to our previous two papers. We show that the introduction of a new risky technology can indeed result in excessive risk taking. In our model, the risky technology does not yield any excess expected return compared to the risk free technology. Hence, one would naturally expect that it would not be used. However, we show that, as a result of relative wealth considerations, if its risk is beyond a certain threshold then it is adopted and there is a

welfare loss. In equilibrium, producers may even invest to the point that the expected return on investment is negative. Furthermore, overinvestment increases with the risk of the technology. The riskier the technology the higher the payoff when it succeeds to those who have invested in it and the costlier it is to be left behind. Our analysis provides an explanation for why risky technological innovations promote real investment booms and subsequent busts.

The insights we provide in the above three papers are highly relevant to the current financial crisis as well. While many have blamed, for example, investment banks for holding highly concentrated real estate related portfolios, our work shows that this could have been induced by a rational attempt to hedge “community risk”. For many of the traders working in those banks as for the banks themselves, compensation was determined either explicitly or implicitly based on comparisons to their peers, and outside capital is a limited resource they compete over. When every other bank is earning in excess of 20% a year by investing in real estate, to stay in business you may have no choice but to follow the pack and hold a highly un-diversified real estate portfolio. A natural question is but how did the herding begin? As we show in “Diversification as a Public Good: Community Effects in Portfolio Choice”, it suffices to have a small fraction of the community bias its portfolio to lead the rest to follow.

Portfolio Delegation - the Impact of Incentives

In the work described above, one’s relative wealth in the broader community matters endogenously through competition for shared resources. But relative wealth considerations can also be quite explicit. A leading example is the multi-trillion dollar asset management industry, where fund managers’ compensation contracts often include performance fees that depend on a fund’s performance relative to a pre-specified benchmark. In the US alone combined holdings of mutual funds and pension funds exceeded 20 trillion dollars, as of December 2008. Given the huge size of the delegated portfolio management industry, the presence of these contracts is likely to have a non-trivial impact on the pricing and dynamics of traded securities, potentially leading to important regulatory implications. However, in standard asset pricing theory the role of delegation is ignored, and investors are assumed to trade directly in financial markets.

My research on understanding the impact of incentive contracts in the delegated portfolio management industry has provided both new theoretical insights on the impact of these incentives, as well as new empirical evidence on how these incentives impact portfolio allocations. On the one hand, I have analyzed asset pricing implications of different prevailing fee structures, as well as distortions to funds’ portfolio allocations induced by the presence of dynamic fund flows. On the other hand, I have provided evidence that strongly suggests that mutual funds may manipulate stock prices in response to incentives to move returns between periods.

My paper “**Equilibrium Prices in the Presence of Delegated Portfolio Management**” (*Journal of Financial Economics*, forthcoming), with Domenico Cuoco, is one of the first

to consider the impact of delegation on security prices. We use a dynamic general-equilibrium setting to analyze the impact of different fee structures on portfolio choice decisions as well as asset prices. The contract parameters, the extent of delegation and equilibrium prices of both benchmark and non-benchmark securities are all determined endogenously. The two main performance fees that we analyze are: 1) symmetric (“fulcrum”) fees, common in the mutual fund industry, that provide both a bonus for overperformance and a penalty for underperformance, and 2) asymmetric fees, common in the pension and hedge fund industries, that provide only the bonus on the upside.

With fulcrum fees, the existence of a penalty induces managers to tilt their portfolio towards stocks that are part of the benchmark, for hedging purposes. In equilibrium, this results in a significant positive (negative) price effect associated with addition (deletion) of a stock to (from) the benchmark, consistent with empirical evidence regarding the inclusion of a stock in the S&P 500 index (the most widely used benchmark portfolio). We also find Sharpe ratios of benchmark stocks are typically lower than those of comparable non-benchmark stocks.

With asymmetric fees, since there are no penalties for underperforming the benchmark, managers’ hedging demand for stocks in the index is decreased. Also, fund managers have an incentive to select portfolios having low correlation with the benchmark portfolio, in order to try to maximize the variance of the managed portfolio’s excess return relative to the benchmark portfolio. Consequently, depending on the fund’s performance relative to the benchmark, prices and Sharpe ratios of stocks added (deleted) to (from) the benchmark can either increase or decrease following a change in the composition of the benchmark. Even when the benchmark remains the same, the ranking between Sharpe ratios of benchmark and non-benchmark stocks is sensitive to the fund’s performance relative to the benchmark. These results imply that empirical tests of the impact of additions and deletions to and from the benchmark should be refined to allow for differential impact depending on funds’ performance. We also show that in contrast to common perceptions the presence of asymmetric performance fees can stabilize prices by decreasing the volatility of both benchmark and non-benchmark stocks.

While our main objective is to understand the impact of commonly observed performance contracts on equilibrium asset returns, we also contribute to the debate regarding the rationale for use of performance contracts. In our model, investors and managers have utilities with linear risk tolerance and identical risk aversion. In addition, two distinctive features of our model are that fund investors have direct access to riskless investment opportunities and that they take the fee structure as given when formulating their investment decisions: this is in contrast to standard models of delegated portfolio management, in which the principal is assumed to delegate the management of his entire portfolio and to be able to dictate the fee structure (subject only to the managers’ participation constraint).

At first glance, the principle of preference similarity of Ross (1973) would seem to imply that a linear fee should be optimal. Specifically, Ross showed that, under the stated assumption on preferences, a linear fee achieves first best. However, we show that in our

more natural setting for the fund management industry, where fund investors take fee structures as given when making allocation decisions, asymmetric performance contracts Pareto-dominate purely proportional contracts (as well as fulcrum performance contracts): intuitively, convex performance fees are a way to incentivize fund managers to select portfolio strategies having higher overall stock allocations, benefiting fund investors who have direct access to riskless investment opportunities. Because of the incentive role of performance fees, the optimal benchmark typically differs from the market portfolio. This is in contrast to the existing mean-variance equilibrium models of portfolio delegation, in which the optimal benchmark is the market portfolio and performance fees are dominated by linear contracts.

In this paper we also make an important methodological contribution to the literature. With asymmetric performance fees, a manager's value function is no longer concave, making standard convex optimization techniques unusable. The methodology we develop for solving the problem significantly extends previous work, and can be useful in a wide range of finance applications, specifically in corporate finance, where the use of options in managerial compensation contracts is prevalent, and is an important building block in the related agency literature.

In "Equilibrium Prices in the Presence of Delegated Portfolio Management" I consider equilibrium implications of delegation by considering explicit compensation contracts that are observed in practice, yet I do not allow for dynamic flows. In "**The Delegated Lucas Tree**" Peter Kondor and I consider equilibrium implications of implicit incentives that describe how much capital investors provide dynamically over time to a manager as a function of her past performance. Specifically, we introduce delegation into a standard Lucas exchange economy, where in equilibrium some investors trade on their own account, but others (clients) decide to delegate trading in financial assets to funds: each period clients' allocate capital to funds to manage depending on funds' past relative performance. The fraction of investors who decide to become clients is endogenously determined in equilibrium, and depends on the utility cost of becoming sufficiently knowledgeable and sophisticated to trade in financial markets. We rely on empirical regularities in flows and assume a convex relation between flows and past performance relative to the market, as documented for example in Chevalier and Ellison (1997). Given the significant increase in the fraction of capital delegated to intermediaries over the past 30 year, our analysis focuses on the impact of the interaction of the increased share of delegated capital and the empirically observed convex flow-performance relationship.

A novel insight of our analysis is that the cross sectional distribution of fund returns depends on the equilibrium share of delegation in the economy. At low levels of delegation, all funds choose the same contrarian portfolio, with a beta less than one. However, as the share of delegation increases, there is a threshold above which fund managers follow heterogeneous strategies, even though funds are identical ex ante and all have the same incentive function. In particular, above the threshold as the share of delegation increases a group of decreasing size still follows a contrarian strategy of smaller than one market beta, while a group with increasing size follows a leveraged strategy by borrowing and investing more than 100% of their assets under management in

the stock. The sizes of these two groups are determined in equilibrium so that prices make each manager indifferent between the two strategies. This pattern is a consequence of the interaction of the shape of the flow-performance relation and the larger share of capital that is delegated to funds. When the market is dominated by fund managers, if each manager followed the same strategy they could not beat the market in any state of the world, and would not profit from the convexity of the flow-performance relation. Instead, in equilibrium the group of managers' who leverage up beat the market and receive large capital inflow in the high state, while the other group beats the market and obtain large capital flows in the low state. Thus, there are gains from trade: funds with identical incentives utilize heterogeneous trading strategies, trade among themselves, and consequently the gross amount of borrowing and lending increases. This result provides a novel mechanism for explaining the sharp increase in the size of repo markets, as well as open interest in futures markets, over the last decades.

To understand why when the share of delegation is low funds follow a contrarian strategy, consider the case when financial markets are only populated by direct traders and the first fund manager enters. She can decide whether to take a sufficiently contrarian position to over perform and get high capital flows in recessions, or to take a sufficiently levered position to get high capital flows in expansions. The probability of an expansion is larger than the probability of a recession. Thus, the relative over performance implied by her optimal contrarian position must be larger than the one implied by her optimal levered position, because the former over performs in the low probability state. Because convex flows reward over performance disproportionately, she values this larger over performance and picks the contrarian position.

Our model implies that average fund outperforms the market in recessions and underperforms in expansions, and that there should be more cross sectional dispersion in fund returns in recessions versus in expansions. Both these empirical predictions are consistent with recent evidence. We also derive empirical predictions linking the share of delegation to the Sharpe ratio and skewness of returns. Interestingly, both the Sharpe ratio and skewness follow an inverted U-pattern as the share of delegation increases.

To solve the model we introduce a new powerful modeling device by approximating the convex relation between flows and excess returns by a piece-wise constant elasticity function. The combination of log utility with incentive functions of this particular functional form allows us to derive analytical formulas for the different equilibrium quantities. This combination results in a locally concave, but globally non-concave portfolio problem for managers. The first property keeps the framework tractable, while the second property ensures that we do not lose the general insight connected to convex incentives. This modeling device should be useful in other settings as well.

In "The Delegated Lucas Tree", our focus is on equilibrium implications. While we consider the implications of a performance flow relation, we abstract from providing micro-foundations for the source of the dynamic flows. My paper "**Mutual Fund Portfolio Choice in the Presence of Dynamic Flows**" (*Mathematical Finance*, 2010), with Julien Hugonnier, is an important first step toward understanding how optimally

determined dynamic flows in and out of mutual funds impact fund managers' portfolio choice decisions. We analyze the implications of a fee that is a fixed fraction of assets under management, the most commonly observed fee in the mutual fund industry, in a setting where both the fund and investors are allowed to make dynamic allocation decisions.

In our model, a small investor and a fund manager each solve a dynamic optimization problem. The complicating factor is the fact that the two problems are linked, leading to a non-trivial stochastic differential game. Our solution method relies in part on the theory of backward stochastic differential equations and its links to the study of optimal control problems. Our paper is one of the first papers in finance to utilize such tools.

With a stationary opportunity set the manager's and the investor's incentives are aligned, and the manager's portfolio is the one that, at each point in time, maximizes the amount of money the investor delegates to the fund at that time. However, we show that with a stochastic opportunity set the presence of dynamic flows induces "flow hedging" portfolio distortions on the part of the fund, even when the small investor is myopic. In selecting a portfolio, the manager takes account of the fact that the fraction of wealth delegated to the fund's management by a myopic investor is determined by the net-of-fees instantaneous Sharpe ratio provided by such an investment; a measure quantifying the tradeoff between return and risk. In states of the world where the opportunity set is good (bad) and the maximal Sharpe ratio is high (low) the manager receives a larger fraction of the investor's wealth, which increases management fees. This leads the fund manager to distort the bond to stock mix as well as the equity portfolio, in order to increase the correlation between the investor's overall return and the quality of the future opportunity set (i.e., the Sharpe ratio). The distortions are economically significant. Consistent with empirical evidence, our model produces an increasing relation between fund flows and lagged returns, even with complete information. Standard models require assuming incomplete information to produce such a relation. We also predict a positive relation between a fund's fee rate and its equity exposure, or alternatively its volatility.

It is a well-documented empirical fact that a convex relation exists between net new investment and past performance for equity mutual funds not only when performance is measured relative to the market, as in Chevalier and Ellison (1997), but also when it is measured in comparison to other managers, so that fund managers get more benefit from improving their rank relative to other funds if they are near the top of the distribution; shown for example in Sirri and Tufano (1998). Because of this, relative rank considerations may cause managers to distort their portfolio choices. Specifically, on the last day of a reference period, fund managers get more benefit from moving performance to that period from the next if their period-to-date performance is near the top of the distribution. They are in the high-slope region of the flow-performance relation for this period and empirical evidence shows that they are not particularly likely to be there for the next. This increases their incentive to move performance from the next reference period by marking up the portfolio.

In our paper “**Leaning for the Tape: Evidence of Gaming Behavior In Equity Mutual Funds**” (*Journal of Finance*, 2002), Mark Carhart, David Musto, Adam Reed and I present compelling evidence that money managers respond to the incentive to move returns between periods. They do so by marking up their holdings at quarter-end through aggressive last-minute trading of stocks they already hold, taking advantage of the fact that mutual funds net asset values per share (NAVs) are generally calculated from closing transaction prices of their holdings. As a result, quarter-end prices of equity funds are inflated. The magnitude of price inflation ranges from 50 basis points per year for large-cap funds to well over 200 basis points for small-cap funds. Funds with the greatest ability and most incentive to mark up their performance are shown to exhibit the largest turn-of-quarter effect. This turn-of-quarter inflation of their prices gets mostly reversed the following day and is a significant opportunity for potential sellers, and a significant hazard for everyone else. The results of our paper, and their implications, have been widely discussed in the media. Our paper has been mentioned multiple times in leading newspapers such as the *Wall Street Journal*, the *New York Times*, and the *Washington Post*. Our work has also impacted regulators. Given that this behavior raises important regulatory concerns, the paper was presented at the SEC. Subsequently, some large “respectable” funds, such as ABN Amro (the United States subsidiary of ABN Amro Holding of Netherlands) have been sanctioned by the SEC for their portfolio pumping practices. The paper was nominated for the Smith Breeden Prize as best paper published by the *Journal of Finance* in 2002.

A different type of incentive mechanism that impacts investors’ portfolio choice decisions is that induced by the capital gains tax. In my paper “**Tax Management Strategies with Multiple Risky Assets**” (*Journal of Financial Economics*, 2006) with Michael Gallmeyer and Stathis Tompaidis, we investigate the optimal consumption-portfolio problem of an investor who is subject to capital gains taxation and can invest in two risky assets and one risk-free asset. Our approach is unique because it focuses on the benefits of short-selling strategies. We uncover two different strategies where it is optimal to sell short. The first, which we term the “trading flexibility strategy,” is novel to the literature and is the main contribution of the paper. It is an ex-ante way of minimizing future tax-induced trading costs. With this strategy, an investor, having access to positively correlated stocks with the same expected returns and standard deviations, may short one of the stocks even when neither stock has an embedded gain. The second strategy is an imperfect form of a strategy known in the literature as “shorting-the-box”; i.e., selling short an asset that you already own, which has accumulated a capital gain. In our context, as with current tax law, shorting-the-box is not allowed, but the investor engages in a similar strategy when the risky assets are highly positively correlated, by shorting the other asset. Given these two short-selling strategies, it is common for an unconstrained investor to short some equity, while an investor who is constrained from shorting holds a positive investment in all stocks. A similar trading flexibility strategy is implicitly present if the investor can’t short but is allowed to buy put options.

We find that the ability of the investor to short is quite valuable, in terms of wealth equivalents, and that imposing shorting costs or constraints to shorting reduces the

benefit drastically. In fact, for investors who are prohibited from shorting the benefit of trading separately in the two stocks, as opposed to trading an index of the two, is not economically significant.

The optimization problem is challenging because there are five state variables and three decision variables, plus a variable for time. At the time we wrote the paper, it was one of the first to use parallel computing in finance. To solve the model, we developed a parallel dynamic programming algorithm on a Cray computer (as well as on a cluster of close to a hundred desktops, which we created by “taking over” a students’ computer lab during the summer). The numerical algorithm can be used in other high-dimensional problems. The paper appeared as a lead article in the *Journal of Financial Economics*.

Trading and Return Predictability

Market efficiency and stock return predictability have been at the core of research in finance for more than three decades. Yet until recently, relatively little has been understood about the role of trading volume, and order imbalances of different segments of the investment community, in impacting the return process and predicting the direction of future returns.

In “**The High Volume Return Premium**” (*Journal of Finance*, 2001), with Simon Gervais, Dan Mingelgrin and I investigate whether trading activity contains information about future prices. In particular, we study how trading activity in an individual stock is related to the future price evolution of that stock. Our approach is novel in that in contrast to previous literature it looks at the inter-temporal role of volume as an exclusive conditioning variable for predicting directional price changes. The semi-strong form of the efficient market hypothesis predicts that trading volume should not have any predictive power over and above an appropriate measure of risk.

We present compelling evidence for the existence of a *high volume return premium*. Specifically, we demonstrate that stocks that experience unusually high (low) trading volume over a day or a week tend to appreciate (depreciate) over the course of the following month, and that these extra returns cannot be explained by risk. We present evidence suggesting that one can, in fact, construct profitable trading strategies to exploit the high volume return premium.

While the results in the paper are clearly at odds with the efficient market hypothesis, they do provide strong support for the hypothesis that trading activity in a stock affects its visibility, and in turn the subsequent demand and price for that stock. Merton’s (1987) investor recognition hypothesis implies that incomplete information diffusion across investors will lead to situations where some investors are unaware of certain securities. As a result, investors will be inadequately diversified and will demand a premium for taking on nonsystematic risk, causing a stock’s required rate of return to depend on its investor base. A stock that achieves increased visibility, and consequently increases its investor base, should experience a reduction in the cost of capital and a concomitant

increase in the firm's market value. We show that a multitude of other alternative hypotheses come up short in explaining the premium.

Given that I have identified the high volume premium using US data, a natural important out of sample test is whether the premium exists outside the US as well. My paper "**The High Volume Return Premium: Cross-Country Evidence**" (*Journal of Financial Economics*, forthcoming), with Arzu Ozoguz and Laura Starks, evaluates the presence of the high volume return premium across 41 countries. We find that the premium is a pervasive international phenomenon, existing virtually in all developed countries. In contrast to previous studies of the investor recognition hypothesis that focused exclusively on within-country analysis, we also utilize differences in trading and demographic characteristics across countries, which affect the costs of being informed and the degree of a stock's visibility. We show that the magnitude of the premium is associated with country characteristics hypothesized to affect returns subsequent to a change in a stock's visibility. However, while Merton's model focuses on differential information across investors assuming securities have the same quality of information, we show that quality of information plays an important role in explaining the premium as well. Specifically, the premium is smaller when information about the firm is opaque, as lower information quality leads to a smaller increase in the potential investor base following a visibility event such as a high volume shock. The paper received the FMA European Meeting Best Paper Award, 2003.

In both the "The High Volume Return Premium" and the "The High Volume Return Premium: Cross-Country Evidence" we use extreme volume shocks as a predictive variable, without conditioning on the source of the observed trading volume. However, the predictive role of trading volume may differ depending on the entities trading. For a variety of reasons, financial economists tend to view individuals and institutions differently. Institutions are generally much larger, are more sophisticated, and are believed to be better informed than individual investors. Individuals, on the other hand, are said to have psychological biases and are often thought of as the proverbial "noise traders" modeled, for example, by Kyle (1985) or Black (1986).

In "**Individual Investor Trading and Stock Returns**" (*Journal of Finance*, 2008), with Gideon Saar and Sheridan Titman, we challenge these widely accepted views by examining the dynamic relation between individual investors' trading activities and stock returns. We utilize a unique dataset provided to us by the NYSE that enables us to determine the aggregate daily buy and sell volume of individual investors for a comprehensive cross-section of NYSE stocks. Consistent with previous studies we find that individuals trade as if they are contrarian. More interestingly, we show that stocks exhibit significant excess returns in a month that follows a week of intense buying by individuals. These patterns are consistent with the idea that risk-averse individuals provide liquidity to meet institutional demand for immediacy.

The fact that risk-averse agents should be compensated for liquidity provisions by receiving a higher return is well understood. However, our new and important insight is that individual investors potentially serve in part as liquidity providers. Our results are

provocative and significantly challenge the common view that individual investors are simply proverbial “noise traders”. The paper was a finalist for the Smith Breeden prize for the best paper published in the *Journal of Finance* in 2008, and received the Glucksman Institute Research Prize second place award for best Stern School of Business research papers in finance, 2004.

In a follow-up project, **“Investor Trading and Return Patterns Around Earnings Announcements”** (under second round review at the *Journal of Finance*), the three of us, together with Shuming Liu, provide evidence to support an even more controversial claim: not only do individual investors get compensated for liquidity provisions, some of them may even possess private information which they profitably take advantage of. We advance this argument by using the same data set to understand the role individual investors’ trading plays around earning announcements. We find that intense individual buying (selling) prior to the announcement is associated with significant positive (negative) excess returns on the announcement date and in the three months following the announcement. Consistent with the evidence in our earlier paper, we show that part of the pattern described above can be attributed to compensation for liquidity provision. However, our additional insight is that we show that when individuals’ intensely sell before the announcement there is a significant component of the excess returns that does not seem to be explained by the liquidity provision hypothesis, and is likely driven by private information.

We also find that following the event, individuals are especially active in selling (buying) stocks that experience both the most positive (negative) earnings surprises and the most positive (negative) excess returns in the post-event period. This behavior is consistent with the hypothesis that individuals’ trading activity slows down the adjustment of prices and contributes to the creation of post-earnings announcement drift. While trading in the opposite direction to the drift may seem like a dubious strategy, combining our findings on their trading before and after the event suggests that individuals may be profitably reversing positions that they entered prior to the announcements. As in our earlier work, this is in contrast to the commonly imputed “noise trader” role of individuals. The results we present in these two papers suggest that finance researchers re-evaluate the role of individual investors in financial markets.

Post earnings-announcement price drift is one of the most intriguing and empirically robust findings about stock price dynamics, as is return momentum (stocks that have gone up (down) in the last six month to a year tend to go up (down) in the subsequent year). Both these phenomena imply that, conditional on past performance, future stock returns continue to drift in the same direction. Attempting to understand and rationalize these findings is a central question in finance; it has attracted considerable research effort by many top scholars over the past fifteen years, and continues to do so. At the core of the debate is the question of the appropriate over-arching paradigm to be used in understanding financial markets. One of the leading paradigms is the ‘Rational Expectations Equilibrium’ (REE) concept. However, in recent years there has been resurgence in interest in the ‘Difference of Opinions’ (DO) paradigm, where agents agree to disagree.

A common, and somewhat casual, explanation for price drift is based on the intuition that noise in financial markets will cause prices to aggregate information slowly, resulting in drift as prices gradually approach the fundamental value. A more involved explanation, proposed for example by Allen, Morris and Shin (2006), is based on the notion that in a dynamic REE investors may need to forecast the forecasts of others, as in Keynes' (1936) "beauty contests." However, the beauty contest metaphor seems to better describe a DO environment, where agents disagree but account for the taste of others. In my paper "**Price Drift as an Outcome of Differences in Higher Order Beliefs**" (*Review of Financial Studies*, 2009), with Snehal Banerjee and Ilan Kremer, we take a closer look at the role of slow aggregation of heterogeneous information in generating price drift, considering both the REE and DO setups.

Our results challenge the above views. We show that in REE models, such as Allen, Morris and Shin (2006), there is no price drift, as prices are a sufficient statistic for the information available. This different conclusion is due in part to the difference between an *ex-post* notion of price drift that depends on realized price paths which is the premise used in Allen, Morris and Shin (2006), and an *ex-ante* measure that conditions only on past prices--which we argue is the more appropriate measure. We find that dynamic DO models can generate price drift. However, this requires disagreement about high order beliefs, for example disagreement across investors about the average valuation of other investors. With common knowledge, prices are again a sufficient statistic, (this time for the average beliefs), resulting in no price drift. While most DO models impose a common knowledge assumption, our results highlight a fundamental limitation of this strong assumption. Relaxing this assumption can potentially lead to other important implications for capital markets. The fact that relaxing the common knowledge assumption helps explain key puzzles such as post announcement drift and momentum re-emphasizes, together with my work on relative wealth considerations and portfolio delegation discussed above, the importance of considering different dimensions of investor heterogeneity.

The existence of return trends begs the question of whether traders take advantage of such trends in determining their portfolio allocations. One central class of traders is institutional investors, who hold the bulk of traded securities. The tendency of institutional investors to chase return trends is a well-documented phenomenon that has received considerable attention in financial economics. Also known as positive-feedback trading or momentum investing, trend-based strategies call for buying (selling) financial assets with high (low) recent returns. Past research has typically taken such behavior as given and analyzed its asset pricing implications. Yet, very little is known about why investors trade in this way. Without a better understanding of the causes of trend chasing, it is difficult to properly assess its consequences.

It is tempting to link the evidence on trend chasing to return predictability; perhaps institutional investors implement mechanical strategies designed to exploit the momentum anomaly. While some institutional investors indeed specialize in trading on

momentum, a closer look at the existing evidence suggests that the momentum anomaly may not be the primary reason for the observed trend chasing behavior.

In “**Why Do Investors Chase Return Trends?**” (under revision for re-submission to the *Journal of Financial Intermediation*), with Aydogan Altı and Uzi Yoeli, we propose, model, and test a simple explanation for institutional investors' tendency to chase return trends. When investors face uncertainty about the precision of their private information, they wait for subsequent confirming news before establishing stock positions. While such news impacts the stock price, at the same time it increases investors' estimates of the precision of their information. With low information quality, the latter effect dominates and causes investors to purchase the stock after confirming good news. Investors resemble trend chasers, but they do not trade stocks based on past returns per se; rather, news that drives stock returns also triggers trades by affecting investors' confidence in the validity of their initial analyses.

Analyzing mutual funds' stock purchase decisions, we find that there is indeed a strong link between information quality and the tendency to chase return trends. Our empirical framework introduces a new methodology of conditioning on stock-specific past investment performance as a proxy for funds' stock-specific information quality. The same approach can be extended to analyze trading behavior of other groups of investors as well.

Previous studies typically view trend chasing as a destabilizing force on asset prices. This view mainly rests on the assumption that trend chasers engage in mechanical return-based strategies. Our results reveal that what at first appears to be mechanical trend chasing behavior may in fact represent trading activity by privately informed investors. The impact of such trading activity on asset prices is likely to be stabilizing.

Other Finance Related Research

A few papers in my finance research portfolio are not tightly linked to the subjects discussed above.

The papers on portfolio choice which I discuss above analyze and discuss portfolio allocation decisions in the presence of incentives, while ignoring microstructure considerations. However, microstructure considerations such as order placement strategies are important as well. Incentives for trading differ depending on whether an agent is informed or not. Specifically, whether an investor is informed impacts the decision on whether to place a limit order or a market order. In “**So What Orders Do Informed Traders Use?**” (*Journal of Business*, 2006), Hong Liu and I investigate the decisions of informed traders on whether to use limit or market orders from both a theoretical and an empirical perspective. We challenge the almost universal assumption in the microstructure literature that informed traders will use only market orders. Using an equilibrium model, and accounting for the impact of order type on the quote updating process, we show both that informed traders may prefer to use limit orders, and that the

probability they submit limit orders can be so high that in equilibrium limit orders convey more information than market orders.

The main driving force in our model is a natural tradeoff between execution risk and price uncertainty. Two important factors that affect this tradeoff are the horizon of the private information and the degree of mispricing. Longer-lived information decreases the execution risk inherent in placing a limit order, thereby increasing the probability that an informed trader will prefer a limit order. On the other hand, larger degrees of mispricing implicitly increase the cost of not executing the trade, causing informed traders to prefer market orders. Interestingly, in equilibrium, as long as the mispricing is not severe, informed traders prefer placing limit orders. As the horizon of the private information increases, so does the use of limit orders by informed traders. Our empirical tests support the hypothesis that limit orders are more likely to be placed by informed traders. Other papers have provided additional empirical support for our predictions. The paper received the Geewax, Terker & Company Prize for best paper published in the Wharton's Business School? Rodney L. White Center working paper series, 1998.

My work on relative wealth considerations has focused on how they can arise endogenously, and the important role they can play in explaining central empirical regularities/puzzles. The literature has considered a variety of explicit relative wealth optimization criteria as well. One such criterion is regret minimization for games under uncertainty, where an investor minimizes the cost ratio between her strategy and a strategy of better informed agents. While targeted at a computer science audience, my paper **“Competitive Optimal Online Leasing”** (*Algorithmica*, 1999), joint with Ran El-Yaniv and Nati Linial, assumes a regret minimization criteria, and considers a leasing versus buying decision for an agent who does not know ex-ante for how long she will need some equipment, and may not even know the distribution of the length of time she will use the equipment for. The paper is one of the first to analyze robust decision rules in a financial economics setting, a topic receiving increased attention in the past five to ten years.

Finally, efficient computation of hedge ratios for complex options, on top of being a challenging academic question, is one which is immensely important for practitioners. In my paper **“Efficient Computation of Hedging Parameters for Discretely Exercisable Options”** (*Operations Research*, 2008), joint with Stathis Tompaidis and Alexander Zemliyanov, we study the problem of obtaining confidence intervals for hedge ratios for options that can be exercised at discrete times prior to the option expiration time. The method we develop uses Monte-Carlo simulation and is based on a combination of the duality formulation of the optimal stopping problem for pricing discretely exercisable options, and Monte-Carlo estimation of hedging parameters for European options.

The intuition behind our algorithm is that a discretely exercisable option is equivalent to a European option that expires on the first exercise date of the discretely exercised option. The value of the payoff of this European option is equal to the price of a discretely exercisable option, starting on the first exercise date of the original option and having one exercise date less. To estimate the sensitivities of the original, discretely exercisable

option, we apply the likelihood ratio algorithm proposed by Broadie and Glasserman (1996) to the corresponding European option. Since, in order to apply the likelihood ratio algorithm, we need to know the value of the corresponding European option, which delivers a new, discretely exercisable option, we use the duality based Monte-Carlo algorithm for approximating prices of discretely exercisable options. Judicious use of the confidence intervals for the option price then leads to confidence intervals for the option sensitivities.

For a given computer budget and exercise strategy our algorithm achieves the tightest confidence intervals. It is superior to alternative algorithms in terms of both accuracy and speed. The method can handle arbitrary payoff functions, general diffusion processes and, in principle, jumps and a large number of random factors. It can be potentially applied to other problems in stochastic control that involve optimal stopping, in particular in problems in the area of real options with several random factors.

Future Direction of Research

My research is in the asset pricing sub-field of finance. Within the asset pricing sub-field my past research has mostly concentrated in the three sub-areas discussed earlier in this statement: relative wealth considerations, portfolio delegation, and trading and return predictability.

In the next five years I intend to focus my research on two objectives. First, I want to continue examining the role that relative wealth considerations play in helping to explain the dynamics of financial markets, and the decisions made by agents within these markets. Second, I want to continue and enhance our understanding of portfolio allocation decisions of delegated portfolio managers such as mutual funds, pension funds, and hedge funds, and how the presence and trades of these financial intermediaries impacts the dynamics of asset prices in financial markets. While I have contributed to both these questions in the past, as I briefly describe below there is still much left to be done.

Below I describe the projects I have started in the past couple of years, as well as those I intend to start in the next few years, and how they fit into the two areas of research I intend to focus on.

Relative Wealth Considerations

In my work on relative wealth considerations I have derived multiple empirical predictions. To test these predictions one needs to have information on individual investors' consumption, as well as information on their financial portfolios. Standard datasets that are used in finance do not contain sufficient information, specifically information about consumption of individual investors, to allow for a relatively clean test of these predictions. In **“The Impact of Relative Wealth Concerns: Evidence from Investors' Consumption and Investment Decisions”** Ilan Kremer, Hans Hvide and I intend to test these predictions using a unique detailed dataset on consumption and

investment of individuals in Norway. It has taken us more than 4 years to construct the data from multiple sources, as some of the data contains very detailed and sensitive information on individual investors and required approval by multiple government agencies. For every individual in our sample, we have detailed information on their financial portfolio and a variety of socio-demographic characteristics (including income, wealth and residence code), as well as information on two important consumption goods: their real estate holdings (including location, type, date of purchase and value) and their vehicle (including make, model, date of purchase and value). This fall we have started working with the data, and intend to start to formally test predictions of our relative wealth consideration theories in the spring semester.

In work with Snehal Banerjee we intend to show that relative wealth concerns had a crucial role in the creation and severity of the recent financial crisis. We will argue that relative wealth concerns led financial institutions to hold excessive risk, to be concentrated in similar assets, and subsequently led to liquidity drying up once the crisis became severe. The intuition behind the driving mechanism will be similar to the one I have provided in my previous papers on endogenous relative wealth consideration. An individual investment bank that observes that all the other large investment banks are earning 20% return a year has essentially no other choice but to follow the crowd and invest in similar risky investments, otherwise it will lose clients to these other banks. A key distinction, however, is that in my previous papers each economic actor was small and thus did not internalize his or her impact on asset prices. As a result, there was no strategic interaction between actors. However, these very large financial institutions are likely to compete strategically, realizing that their investment decisions can impact prices. As part of the strategic interaction we intend to also allow these large financial institutions to hold higher order beliefs about the investment decisions of the other banks (what does bank A believe that bank B believes that bank A will do in a given economic environment, etc.), relying in part on our previous work “Price drift as an Outcome of Differences in Higher Order Beliefs”.

My work on relative wealth considerations has thus far focused on issues related to asset pricing. In the future I intend to investigate what implications relative wealth concerns have in a corporate finance setting as well. One question that I have recently started thinking about, together with Peter Demarzo, is to try to understand how managerial compensation contracts differ with and without relative wealth considerations. One fact that people find hard to justify is why CEO compensation contracts typically do not compensate CEOs based on performance relative to other similar companies. Accounting for relative wealth considerations may in fact provide a fairly simple resolution to the puzzle, in that relative wealth considerations implicitly penalize managers for underperforming relative to their peers. This eliminates the need for compensation to depend explicitly on relative performance.

Portfolio Delegation - the Impact of Incentives

While my paper “Equilibrium Prices in the Presence of Delegated Portfolio Management” considers the impact on prices in financial markets of either mutual funds

or pension/hedge funds it does not consider an economy where both types of institutions are present together. Similarly, in “The Delegated Lucas Tree” I assume all managers are subject to the same incentive function. The next natural step is to analyze equilibrium implications of the co-existence of heterogeneous financial intermediaries, with differing incentive functions. The modeling tool that Peter Kondor and I have developed in “The Delegated Lucas Tree” is sufficiently general to allow us to tackle this very challenging question, and we have recently started working on a dynamic equilibrium model in which mutual funds and hedge funds co-exist. Some of the questions we intend to look into include which institution class bears more risk in downturns and how the interactions of these two different types of financial intermediaries impact asset return dynamics in different economic conditions.

My papers “Equilibrium Prices in the Presence of Delegated Portfolio Management”, “The Delegated Lucas Tree”, and “Mutual Fund Portfolio Choice in the Presence of Dynamic Flows” focus on settings where the fund management industry is competitive. Alternatively, there are settings where there is strategic competition between fund managers. In ongoing work (“**Putting Your Money Where Your Mouth is: the Effect of Commitment and Competition on Mutual Fund Allocations**”, with Stathis Tompaidis and Ti Zhou) I take a first step in understanding the implications of strategic competition within the fund industry in a dynamic setting by extending the analysis in “Mutual Fund Portfolio Choice in the Presence of Dynamic Flows” to allow for two competing strategic fund managers to co-exist. We find that competition leads to higher exposure to equity, higher expected fund returns and higher idiosyncratic volatilities of fund returns. Our analysis provides some additional interesting empirical predictions. For example, we predict that replacement of a manager should be followed by decreased (increased) volatility of fund returns if the replacement follows a series of negative (positive) fund returns. Initial empirical tests seem to confirm this prediction. We have a preliminary working paper. Our plan is to polish and submit the paper to a journal by the summer.

In “**Putting Your Money Where Your Mouth is: the Effect of Commitment and Competition on Mutual Fund Allocations**” both investors and managers have full information and there is no asymmetric information between investors and fund managers. In an ongoing follow up project (“**Dynamic Strategic Competition with Asymmetric Information: Theory and Evidence from the Mutual Fund Industry**”), Stathis Tompaidis and I are working on understanding how does the nature of the competition change once we introduce asymmetric information between investors and fund managers, and also potentially between different fund managers as well. We already have some results for the case with asymmetric information between investors and managers, and are currently working on solving models where there is also asymmetric information between managers as well. This is a hard problem because not only is there asymmetric information about fundamentals, but while fund returns are observable the allocations are not. Managers are strategic in their dynamic allocations, taking account of the fact that both other managers and investors attempt to infer a manager’s allocation and the value of his information from observing the fund’s returns. We anticipate we will have a distributable working paper within a year or so.

In my paper “Mutual Fund Portfolio Choice in the Presence of Dynamic Flows” I have assumed that funds compensation contracts depend on the fraction of assets under management. While these contracts are prevalent in practice, an important next step is to determine whether they are optimal. In work that I have started recently with Jaksá Cvitanic we allow managers to have better information than investors and are trying to derive the optimal dynamic contract. This is a very challenging problem, given the hierarchical information structure, and it is too early to assess the odds of success.

Combining the two (long run plan)

Relative wealth considerations play a key role in the delegated portfolio management industry. It is well documented that relative fund performance impacts flows into funds, which of course generates fees. Also, many fund managers’ compensation contracts depend explicitly on how the fund performs relative to its peers. I intend to eventually solve a dynamic general equilibrium model with the following main features. First, different classes of delegated portfolio institutions within the same economy: mutual funds, pension funds and hedge funds. These institutions compete for households’ money among themselves both between and across institution type. Second, both exogenously specified and endogenously determined relative wealth considerations. Third, a household sector that is allowed to trade on their own, but also through financial intermediaries, where trading on your own is more costly. These households need to be able to trade dynamically in stocks and be able to make dynamic allocations into mutual funds. Fourth, allowing for differential information between different agents.

This is a big task that requires multiple building blocks that need to come together. Some of these building blocks I have already created in my past research, and some as discussed above I am currently working on developing. My papers “Diversification as a Public Good: Community Effects in Portfolio Choice”, “Relative Wealth Concerns and Financial Bubbles”, and “Technological Innovation and Real Investment Booms and Busts”, have established the foundations for the relevance and importance of relative wealth considerations as an important channel that can help explain home bias, bubbles in the financial markets and overinvestment. On the other hand, my paper “Equilibrium in the presence of delegated portfolio management” is the first to incorporate delegated portfolio management in a general equilibrium dynamic framework. It also develops methodology that will be useful to me in solving more complex setting. My paper “Mutual Fund Portfolio Choice in the Presence of Dynamic Flows” introduces techniques for solving delegated portfolio management problems in the presence of dynamic flows (i.e., investors are allowed to dynamically change the amount of money they delegate to the fund). My working paper “The Delegated Lucas Tree” introduces a method for approximating general shaped flow functions that is very tractable, and can easily be utilized in other settings as well.

Combining the building blocks that I have built in the past and the projects that I have started working on in the past few years should help to eventually tackle this problem.

Research Impact

A. Citations and Downloads

As of October 2010 I have 225 citations in published articles (Source: ISI Web Citations Index), and 1170 in total (Source: Google Scholar). My working papers have been downloaded more than 7,600 times from the Social Science Research Network (SSRN) website.

B. Research Awards

My paper, “**Individual Investor Sentiment and Stock Returns**” was a finalist for the Smith Breeden Prize for the best paper published in the *Journal of Finance* in 2008, and also received the 2004 Glucksman Institute Research Prize second place award for best Stern School of Business research papers in finance; competition consisted of 17 papers. My paper “**Leaning for the Tape: Evidence of Gaming Behavior in Equity Mutual Funds**” was nominated by the associate editors of the *Journal of Finance* for the Smith Breeden Prize in 2002; “**Diversification as a Public Good: Community Effects in Portfolio Choice**” was nominated for the same prize in 2004.

My paper “**The High Volume Return Premium: Cross-Country Evidence**” received the 2003 FMA European Meeting Best Paper Award. “**So What Orders Do Informed Traders Use?**” was awarded the 1998 Geewax, Terker & Company Prize for best paper published in Wharton's Rodney L. White Center working paper series. The competition for this prize consisted of 21 other working papers, most written by Wharton finance faculty.

Two of my papers have been published as lead articles: “**Tax Management Strategies with Multiple Risky Assets**” in the *Journal of Financial Economics*, and “**Efficient Computation of Hedging Parameters for Discretely Exercisable Options**” in *Operations Research*.

C. Other Evidence

My papers have been listed on multiple graduate course syllabi. Some of the schools include: Chicago, London School of Economics, Mannheim, MIT, NYU, Ohio State, Wharton, Stanford, Texas Tech, Tulane, University of British Columbia, University of Texas at Austin, and Yale.

Because some of my research reflects a practical orientation to topical issues, my research has also attracted interest from practitioners, especially in the money management industry. My paper “**Leaning for the Tape: Evidence of Gaming Behavior in Equity Mutual Funds**” has received considerable media coverage, as well as attention from regulators. It has been discussed multiple times in the *Wall Street Journal*, the *New York Times*, the *Washington Post*, and other newspapers and magazines listed on my vitae. It was presented at the SEC, and subsequently some funds were

sanctioned by the SEC for their portfolio pumping practices. Variations of the trading volume based strategies we identify in the paper “**The High Volume Return Premium**” have been used by some quant hedge funds as part of their trading strategy. My paper “**Individual Investor Sentiment and Stock Returns**” utilizes a proprietary data set provided to us by the NYSE that tracks separately trades by individuals and sub-groups of institutions on a daily basis. When we first approached the NYSE in 2000, it was storing only the last 6 months of data, for its own use, which is why our data does not go back before 2000. Our paper sparked interest from a variety of institutional investors who wanted to implement trading strategies based on our findings. Eventually, the NYSE realized the commercial value of selling the data to practitioners. It started doing so in 2005. The corresponding data feeds are called ReTrac and ProTrac.

Because of my contributions to the literature on trading volume, I was an invited speaker for Controversies in Quantitative Finance and Asset Management, a conference organized by Sanford C. Bernstein & Co. for a few hundred of their hedge fund clients. The other four presenters in this conference were all very well established chaired professors: John Y. Campbell, Campbell R. Harvey, Narasimhan Jagadeesh, and Katherine Schipper.

I have presented my research at more than 40 business schools, including Berkeley, Carnegie Mellon, Chicago, Columbia, LBS, LSE, MIT, Northwestern, NYU, University of Pennsylvania, Princeton, Stanford, Yale, and others as listed on my vitae.

My papers have been presented, mostly by me, at 50 national and international conferences including leading conferences sponsored by the American Finance Association (6 times), Western Finance Association (5 times), National Bureau of Economic Research (NBER) (3 times), Utah Winter Finance Conference (2 times), Center of Economic Policy Research (CEPR) Summer Symposium on Financial Markets (2 times), Stanford Institute for Theoretical Economics (SITE), and other conferences listed on my vitae.

I was an invited speaker in 5 conferences, two outside the field of finance.

In 2009, I was appointed as Faculty Research Fellow the Center of Economic Research (CEPR).

References

Own Research References

- [1] “Individual Investor Trading and Stock Returns,” (with G. Saar and S. Titman), *Journal of Finance*, 2008, 63(1), 273-310.
Finalist for the **Smith Breeden Prize** for best paper published by the *Journal of Finance*, 2008.
Glucksman Institute Research Prize second place award for best Stern School of Business research papers in finance, 2004.
- [2] “Technological Innovation and Real Investment Booms and Busts,” (with P.M. DeMarzo and I. Kremer), *Journal of Financial Economics*, 2007, 85, 735-754.
- [3] “Efficient Computation of Hedging Parameters for Discretely Exercisable Options,” (with S. Tompaidis and A. Zemlianov) , *Operations Research*, 2008, 56(4), 811-826 (lead article).
- [4] “Relative Wealth Concerns and Financial Bubbles,” (with P.M. DeMarzo and I. Kremer), *Review of Financial Studies*, 2008, 21(1), 19-50.
- [5] “Tax Management Strategies with Multiple Risky Assets,” (with M. Gallmeyer and S. Tompaidis), *Journal of Financial Economics*, 2006, 80(2), 243-291 (lead article).
- [6] “So What Orders Do Informed Traders Use?,” (with H. Liu), *Journal of Business*, 2006, 79(4), 1867-1913.
Geewax, Terker & Company Prize for best paper published in the Wharton Rodney L. White working paper series, 1998.
- [7] “Diversification as a Public Good: Community Effects in Portfolio Choice,” (with P.M. DeMarzo and I. Kremer), *Journal of Finance*, 2004, 59(4), 1677-1715.
Nominated for the **Smith Breeden Prize** for best paper published in the *Journal of Finance*, 2004.
- [8] “Leaning for the Tape: Evidence of Gaming Behavior In Equity Mutual Funds,” (with M. Carhart, D. Musto and A. Reed), *Journal of Finance*, 2002, 57(2), 661-693.
Nominated for the **Smith Breeden Prize** for best paper published in the *Journal of Finance*, 2002.
- [9] “The High Volume Return Premium,” (with S. Gervais and D. Mingelgrin), *Journal of Finance*, 2001, 56(3), 877-920.
- [10] “Competitive Optimal Online Leasing”, (with R. El-Yaniv and N. Linial), *Algorithmica*, 1999, 25 (1), 116-140.

- [11] “Mutual Fund Portfolio Choice in the Presence of Dynamic Flows,” (with J. Hugonnier), *Mathematical Finance*, 2010, 20(2), 187-227.
- [12] “The High Volume Return Premium: Cross-Country Evidence”, (with A. Ozoguz and L. Starks), *Journal of Financial Economics*, forthcoming.
FMA European Meeting Best Paper Award, 2003.
- [13] “Price Drift as an Outcome of Differences in Higher Order Beliefs”, (with S. Banerjee and I. Kremer), *Review of Financial Studies*, 2009, 22, 3707-3734.
- [14] “Equilibrium Prices in the presence of Delegated Portfolio Management,” (with D. Cuoco) , *Journal of Financial Economics*, forthcoming.
- [15] “Why Do Investors Chase Return Trends?”, (with A. Alti and U. Yoeli) Working paper, under revision for re-submission to the *Journal of Financial Intermediation*, 2008.
- [16] “Investor Trading and Return Patterns around Earnings Announcements,” (with S. Liu, G. Saar and S. Titman), under second round review at the *Journal of Finance*, 2010.
- [17] “Putting Your Money Where Your Mouth Is: The Effect of Commitment and Competition on Mutual Fund Allocations”, (with S. Tompaidis and T. Zhou), in progress.
- [18] “A Delegated Lucas-tree”, (with P. Kondor), working paper, Duke University, 2010.

Other Research References

- [19] Allen, F., S. Morris, and H. S. Shin, 2006, “Beauty Contests, Bubbles and Iterated Expectations in Asset Markets”, *Review of Financial Studies* 19, 719-752.
- [20] Broadie, M., and P. Glasserman, 1996, “Estimating security price derivatives using simulation”, *Management Science* 42, 269–285.
- [21] Brown, K.C., W.V. Harlow, and L.T. Starks, 1996, “Of Tournaments and Temptations: An Analysis of Managerial Incentives in the Mutual Fund Industry”, *Journal of Finance* 51, 85-110.
- [22] Black, F., 1986, “Noise”, *Journal of Finance* 43, 540-555.
- [23] Chevalier, J., and G. Ellison, 1997, “Risk Taking by Mutual Funds as a Response to Incentives”, *Journal of Political Economy* 105, 1167-1200.

- [24] Kyle, A.S., 1985, “Continuous Auctions and Insider Trading”, *Econometrica* 53, 1315-1336.
- [24] Merton, R.C., 1987, “A simple model of capital market equilibrium with incomplete information”, *Journal of Finance* 42, 483-510.
- [25] Ross, S.A., 1973, “The Economic Theory of Agency: The Principal's Problem”, *American Economic Review* 63, 134-139.
- [27] Tufano, P., and E. Sirri, 1998, “Costly Search and Mutual Fund Flows”, *Journal of Finance* 53, 1589-1622.