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Walliser, "Finding a Way Out of America's Demographic Dilemma," NBER Working Paper No. 8258, April 2001.

⁷ See the discussion in J. Gokhale and K. Smetters, "Measuring Social Security's Financial Problems," NBER Working Paper No. 11060, January

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⁸ K. Smetters, "Is the Social Security Trust Fund Worth Anything?" *American Economic Review (Papers and Proceedings)*, 94 (2) (May 2004) pp. 176–81. Also see, S. Nataraj and J.B. Shoven, "Has the Unified Budget Undermined the Federal Government

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⁹ K. Smetters, "Social Security Privatization with Elastic Labor Supply and Second-Best Taxes," NBER Working Paper No. 11101, February 2005.

Behavioral Finance

Jeremy C. Stein*

Much of my research over the last several years has been in the broad area of behavioral finance. Some of this work investigates the beliefs of less-than-fully rational investors — the valuation models they use, and the particular sources of information that they pay attention to. Another part focuses on the constraints that professional arbitrageurs face because of the agency problems inherent in delegated money management. Finally, a third strand explores the connection between investor irrationality and corporate-finance outcomes.

Simple Models

In attempting to make even the most basic kinds of forecasts, we can find ourselves inundated with a staggering amount of potentially relevant raw data. A large literature in psychology suggests that people simplify such forecasting problems by focusing their attention on a small subset of the available data. One powerful way to simplify is with the aid of a theoretical model. A parsimonious model will focus the user's attention on those pieces of information deemed to be particularly relevant for the forecast at hand; the user will disregard the rest. For example, an investor with an "honest-accounting" model of the world

who examines a firm's annual report may focus on earnings per share, while ignoring much of the other material in, say, the footnotes.

Of course, even people who use very simple models are likely to give up on these models when they fare poorly — as the honest-accounting model is likely to have done in recent years — and to move on to alternatives. Motivated by this idea, Harrison Hong and I study the implications of learning in an environment where the true model of the world is multivariate, but in which agents update only over the class of simple univariate models.¹ If a particular simple model does a poor job of forecasting over a period of time, it is eventually discarded in favor of an alternative — yet equally simple — model that would have done better over the same period. This theory makes several distinctive predictions. For example, it suggests that a high-priced glamour stock has particularly low conditional expected returns, and particularly high conditional volatility, in the wake of recent bad news about fundamentals, because this high-price/bad-news configuration suggests that the potential for a "paradigm shift" among investors is elevated.

In a related vein, Philippe Aghion and I examine a setting in which a firm can devote its efforts either to increasing sales growth or to improving per-unit profit margins, for example by cutting costs.² If the firm's manager is concerned with the current stock

price, she will tend to favor the growth strategy when the stock market is following a valuation model that pays more attention to performance on the growth dimension. Conversely, it can be rational for the stock market to weight observed growth measures more heavily when it is known that the firm is following a growth strategy. This two-way feedback between firms' business strategies and the market's valuation model can lead to purely intrinsic fluctuations in sales and output, creating excess volatility in these real variables even in the absence of any external source of shocks.

Local and Social Influences on Investment Decisions

A number of recent papers show that investors tend to have a strong local bias in their portfolio choices. This bias shows up not only as a preference for domestic as opposed to foreign stocks, but perhaps more strikingly as a preference for those domestic stocks that are headquartered close by.³ While the existence of within-country local bias now seems to be incontrovertible, there is little evidence to date regarding its equilibrium asset-pricing implications.

Hong, Jeffrey Kubik, and I explore these asset-pricing effects.⁴ We begin by constructing a variable we call *RATIO* which, for any given region at any point in time, is equal to the aggregate book value of all firms headquarter-

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tered in the region divided by the aggregate income of all households living in the region. Intuitively, RATIO measures the supply of shares in a region relative to the potential demand for these shares, so we expect it to have a negative impact on stock prices. The data support this hypothesis. For example, if one goes from the Census region with the highest value of RATIO (the Middle Atlantic), to the region with the lowest value (the Deep South), holding all else equal, the implied increase in the stock price is on the order of 8 percent. For smaller-capitalization companies, the corresponding number is roughly 15 percent.

Digging deeper, we find that our results are intimately connected to regional variation in population density. That is, regions with low population density — of which the Deep South is an example — tend to have low values of RATIO, which are associated with higher stock prices. This is because most of the variation in RATIO across regions is driven by the book value component, which is very sensitive to population density. In other words, in spite of low per-capita income, the Deep South is associated with higher stock prices because of an “only-game-in-town” effect: any one company headquartered there faces relatively little competition for local investors’ dollars, because so few *other* companies are headquartered there.

In related work, Hong, Kubik, and I examine social influences on investor behavior, at the level of both individuals and professional money managers. With respect to individuals, we hypothesize that their decision about whether to participate in the stock market is influenced by social interaction: in our model, any given “social” investor finds the market more attractive when more of his peers participate.⁵ We test this theory using data from the Health and Retirement Study and find that social households — those who interact with their neighbors, or attend church — are indeed substantially more likely to invest in the market than non-social households, controlling for wealth, race, education, and risk tolerance. Moreover, consistent with a peer-

effects story, the impact of sociability is stronger in states where stock-market participation rates are higher.

In the context of professional money managers, we show that a given mutual fund manager is more likely to buy (or sell) a particular stock in any quarter if other managers in the same city are buying (or selling) that same stock.⁶ This pattern shows up even when the fund manager and the stock in question are located far apart, so it is distinct from anything having to do with local preference. This evidence can be interpreted in terms of an epidemic model in which investors spread information about stocks to one another by word of mouth.

Limited Arbitrage by Open-End Funds

The vast majority of professionally-managed investment vehicles (mutual funds, hedge funds, and the like) are structured on an open-end (as opposed to closed-end) basis, making it possible for their clients to liquidate shares on demand. Both theory and evidence suggest that the open-end form imposes serious constraints on arbitrageurs, since they are exposed to the risk of withdrawals if they perform poorly in the short run. This risk can make it dangerous for them to put on trades that are attractive in a long-run sense, but where convergence to fundamentals is unlikely to be either smooth or rapid.⁷ For example, open-end funds are unlikely to want to bet heavily against something like the dot-com bubble of the late 1990s.

Given the obvious drawbacks, why is the open-end form so dominant? One answer, in a survival-of-the-fittest spirit, might be that open-ending is an optimal response to agency problems. If a fund is set up on a closed-end basis, dispersed investors have no recourse in the face of managerial misbehavior, and may see their entire investment slowly eaten away. In contrast, if the fund is open-end, investors can liquidate their positions at the first sign of trouble, thereby avoiding large losses attributable to mismanagement or theft.

In a recent paper, I take issue with

the survival-of-the-fittest view.⁸ While maintaining the premise that agency considerations play a crucial role in the decision to open-end, I show that when there is also asymmetric information about managerial quality, the end result may be a degree of open-ending that is *socially excessive*. This is because any one high-quality manager will be tempted to go open-end to signal confidence in his ability, and thereby lure assets under management away from his competitors. This business-stealing effect sets off a counterproductive race to be open-ended, with both high-quality and low-quality managers ultimately being forced to open-end in order not to lose their investors.

Owen Lamont and I present some empirical evidence which is consistent with the idea that the open-end nature of professional arbitrage firms makes it difficult for them to buck aggregate mispricings.⁹ We examine some basic data on the evolution of aggregate short interest, both during the dot-com era and at other times in history. In a striking contrast to the patterns seen in the cross-section of stocks, total short interest moves in a countercyclical fashion. For example, short interest in NASDAQ stocks actually declines as the NASDAQ index approaches its peak. Moreover, this decline does not seem to reflect a substitution away from outright short-selling and towards put options: the ratio of put-to-call volume displays the same countercyclical tendency. One possible interpretation is that as stock prices rise, funds specializing in short-selling realize negative returns, experience outflows of assets under management, and thus have to cut back their positions. More generally, the evidence also suggests that short-selling does not play a particularly helpful role in stabilizing the overall stock market.

Corporate Finance

Stock-market inefficiencies like the dot-com bubble are of particular interest to economists to the extent that they influence the allocation of real resources, such as corporate investment. Malcolm Baker, Jeffrey Wurgler, and I attempt to address this

question.¹⁰ We use a simple model to outline the conditions under which corporate investment is in fact sensitive to non-fundamental movements in stock prices. The key prediction of the model is that stock prices have a stronger impact on the investment of “equity dependent” firms — those firms that need external equity to finance marginal investments. Using an index of equity dependence based on the work of Kaplan and Zingales (KZ), we find strong support for this hypothesis.¹¹ In particular, firms that rank in the top quintile of the KZ index have investment that is almost three times as sensitive to stock prices as firms in the bottom quintile.

In another corporate-finance application, Baker and I try to understand how non-financial managers might be able to successfully time the market for seasoned equity offerings (SEOs) even without access to any private information or special insight about future stock returns.¹² We build a model in which increases in liquidity — such as lower bid-ask spreads, a lower price impact of trade, or higher turnover — predict lower subsequent returns in both firm-level and aggregate data. The model features a class of irrational investors, who underreact to the information contained in order flow, thereby boosting liquidity. In the presence of short-sales constraints, high liquidity is a symptom of the fact that the market is dominated by these irrational investors, and hence is overvalued. If managers do nothing more than simply follow a rule of thumb that involves issuing when the SEO market is particularly liquid — perhaps because their investment bankers find it easier to underwrite issues at such times — then their financing decisions will tend to forecast aggregate stock returns.

Baker, Joshua Coval, and I argue that a bias toward inertial behavior on the part of investors — a tendency to take the path of least resistance — can have significant consequences for corporate financial policy.¹³ One implica-

tion of investor inertia is that it improves the terms for the acquiring firm in a stock-for-stock merger, since acquirer shares are placed in the hands of investors who, independent of their beliefs, do not resell these shares on the open market. In the presence of a downward-sloping demand curve, this leads to a reduction in price pressure, and hence to cheaper equity financing.

We develop a simple model to illustrate this idea, and present supporting empirical evidence. Both individual and institutional investors tend to hang on to shares granted them in mergers, with this tendency being much stronger for individuals. Consistent with the model and with this cross-sectional pattern in inertia, acquirers targeting firms with high institutional ownership experience more negative announcement effects and greater announcement volume. Moreover, the results are strongest when the overlap in target and acquirer institutional ownership is low and when the demand curve for the acquirer’s shares appears to be steep. Overall, this framework may be helpful in explaining why stock-for-stock mergers are a more significant source of equity finance for many firms than SEOs: with SEOs, unlike with mergers, there is no scope for placing shares with inertial investors, so the adverse price impact associated with issuance is likely to be more pronounced.

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² P. Aghion and J. C. Stein, “Growth vs. Margins: Destabilizing Consequences of Giving the Stock Market What it Wants,” NBER Working Paper No. 10999, December 2004.

³ See, for example, J. Coval and T. Moskowitz, “Home Bias at Home: Local Equity Preference in Domestic Portfolios,” *Journal of Finance*, (December 1999), pp. 2045-73.

⁴ H. Hong, J.D. Kubik and J. C. Stein,

“The Only Game in Town: Stock-Price Consequences of Local Bias,” working paper.

⁵ H. Hong, J.D. Kubik, and J. C. Stein, “Social Interaction and Stock-Market Participation,” NBER Working Paper No. 8358, July 2001, and *Journal of Finance*, (February 2004), pp. 137-63.

⁶ H. Hong, J.D. Kubik, and J. C. Stein, “Thy Neighbor’s Portfolio: Word-of-Mouth Effects in the Holdings and Trades of Money Managers,” NBER Working Paper No. 9711, May 2003, and *Journal of Finance*, forthcoming.

⁷ See A. Shleifer and R.W. Vishny, “The Limits of Arbitrage,” *Journal of Finance*, (March 1997), pp. 35-53.

⁸ J.C. Stein, “Why Are Most Funds Open End? Competition and the Limits of Arbitrage,” NBER Working Paper No. 10259, January 2004, and *Quarterly Journal of Economics*, (February 2005), pp. 247-72.

⁹ O.A. Lamont and J. C. Stein, “Aggregate Short Interest and Market Valuations,” NBER Working Paper No. 10218, January 2004, and *American Economic Review*, (May 2004), pp. 29-32.

¹⁰ M. Baker, J. C. Stein, and J. Wurgler, “When Does the Market Matter? Stock Prices and the Investment of Equity-Dependent Firms,” NBER Working Paper No. 8750, February 2002, and *Quarterly Journal of Economics*, (August 2003), pp. 969-1005.

¹¹ S. Kaplan and L. Zingales, “Do Investment-Cash Flow Sensitivities Provide Useful Measures of Financing Constraints?” *Quarterly Journal of Economics*, (February 1997), pp. 169-215.

¹² M. Baker and J.C. Stein, “Market Liquidity as a Sentiment Indicator,” NBER Working Paper No. 8816, February 2002, and *Journal of Financial Markets* (June 2004), pp. 271-99.

¹³ M. Baker, J. Coval, and J.C. Stein, “Corporate Financing Decisions When Investors Take the Path of Least Resistance,” NBER Working Paper No. 10998, December 2004.