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# Investor psychology in capital markets: evidence and policy implications<sup>☆</sup>

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## Abstract

We review extensive evidence about how psychological biases affect investor behavior and prices. Systematic mispricing probably causes substantial resource misallocation. We argue that limited attention and overconfidence cause investor credulity about the strategic incentives of informed market participants. However, individuals as political participants remain subject to the biases and self-interest they exhibit in private settings. Indeed, correcting contemporaneous market pricing errors is probably not government's relative advantage. Government and private planners should establish rules *ex ante* to improve choices and efficiency, including disclosure, reporting, advertising, and default-option-setting regulations. Especially, government should avoid actions that exacerbate investor biases. © 2002 Published by Elsevier Science B.V.

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## 1. Introduction

In 1913, John D. Watson introduced behaviorism, a radical new approach to psychology. He held that the only interesting scientific issues in psychology involved the study of direct observables such as stimuli and responses. He further argued that the environment rather than internal proclivities determine behavior. Behaviorism was later developed by B.F. Skinner in what aimed to be a more rigorous approach to psychology. Skinner and his followers had a highly focused research agenda which excluded notions such as ‘thought’, ‘feeling’, ‘temperament’, and ‘motivation’. Skinner denied the meaningful existence of such internal cognitive processes or states. Based primarily on experiments on rats and pigeons, he argued that all human behavior could be explained in terms of conditioning by means of reinforcement or association (operant instrumental conditioning or classical conditioning).

In retrospect it is astonishing, but for decades (1940–60s) behaviorism was pervasive and dominant in academic psychology in the U.S. Contrary evidence was downplayed or reinterpreted within the paradigm. Eventually, however, a combination of evidence and common sense led to the ‘cognitive revolution’ in experimental psychology, which reinstated internal mental states as objects of scientific inquiry.

This episode exemplifies a common pattern of innovation, overreaching, and long-horizon correction in the soft sciences. Freudian psychology and Keynesian macroeconomics provide other examples. A genuine innovation is interpreted either too dogmatically or too elastically (or both!) by enthusiasts, is extended beyond its realm of validity, yet dominates discourse for decades. Indeed, such patterns seem common in intellectual movements of many sorts.

In financial economics, the most salient example is the efficient markets hypothesis. The efficient markets hypothesis reflects the important insight that securities prices are influenced by a powerful corrective force. If prices reflect public information poorly, then there is an opportunity for smart investors to trade profitably to exploit the mispricing. But, as vividly described by Lee (2001), just because water likes to find its own level does not mean that the ocean is flat. And just because there are predators in the African veldt does not mean there are no prey.

While there are important forces that act to improve market efficiency, the notion of a corrective tendency was carried to extremes by enthusiasts. For example, it is often argued that markets must be presumed efficient on a priori grounds unless conclusively proven otherwise. The classical economists had a broader view. For example, Adam Smith’s analysis of ‘overweening conceit’ and compensating wage differentials across professions described how individual psychology causes mispricing and inefficient resource allocation. In recent years, some finance researchers have returned to such a broader conception of economics, and have denied market efficiency its presumption of innocence. This denial is based upon theoretical arguments that the arbitrage forces acting to improve informational efficiency are not omnipotent.<sup>1</sup> Furthermore, evidence of at least some degree of guilt has accumulated. Even some of the fans of efficient market agree that investors

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<sup>1</sup> See, e.g., DeLong et al. (1990a), Shleifer and Vishny (1997), and Daniel et al. (2001).

frequently make large errors. We review evidence on this issue, together with evidence on market prices which, we argue, provide fairly definitive proof that markets are subject to measurable and important mispricing. We do not claim this to be a surprising conclusion, except relative to the extreme position that even now retains some popularity among academics.

Recent theoretical research suggests that arbitrage by rational traders need not eliminate mispricing. One reason is that there are some psychological biases which virtually no one escapes. A second reason is that when traders are risk averse, prices reflect a weighted average of beliefs. Just as rational investors trade to arbitrage away mispricing, irrational investors trade to arbitrage away rational pricing. The presumption that rational beliefs will be victorious is based on the premise that wealth must flow from foolish to wise investors. However, if investors are foolishly *aggressive* in their trading, they may earn higher rewards for bearing more risk (see, e.g., DeLong et al., 1990b, 1991) or for exploiting information signals more aggressively (Hirshleifer and Luo, 2001), and may gain from intimidating competing informed traders (Kyle and Wang, 1997). Indeed, one would expect wealth to flow from smart to dumb traders exactly when mispricing becomes more severe (Shleifer and Vishny, 1997; Xiong, 2000), which could contribute to self-feeding bubbles.<sup>2</sup>

When intellectual movements overreach, the pain goes beyond the ivory tower. When the error is in economic theory, the scale of the waste can be monumental. The efficient markets hypothesis is largely an exception. Its emphasis upon the wisdom of market prices encourages a becoming humility on the part of academics in proposing government initiatives. Nevertheless, we think at this point it is appropriate for economists to consider the implications for public policy of imperfect rationality in securities and asset markets.

Much of the scientific debate over market efficiency has a policy undercurrent. The efficient markets hypothesis is associated with the free market school of thought traditionally championed at the Universities of Chicago and Rochester. Imperfect rationality approaches are in part associated with East Coast schools that have tended to be much more enthusiastic about government activism.

So, based on intellectual lineages it appears that the scientific hypothesis that markets are highly efficient is linked to the normative position that markets should be allowed to operate freely. Proponents of *laissez faire* seem to have drawn a brittle defensive line: if markets turn out to be substantially inefficient, the city of freedom is open to be sacked.

We argue that this link between efficient markets and the desirability of *laissez faire* is logically weak. An important weakness is that even if investors are imperfectly rational and assets are systematically mispriced, policymakers should still show some deference to market prices. Individual political participants are not

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<sup>2</sup>It is usually presumed that liquidity and the presence of close-substitute securities increases market efficiency, as these reduce the cost and risk to rational investors of arbitraging mispricing. But liquidity also reduces the costs to irrational investors of arbitraging away rational prices. Much evidence suggests that the usual presumption is correct (see, e.g., Wurgler and Zhuravskaya, 2000). Probably this is because smart traders have a better understanding of the high costs and risks of trading illiquid securities.

immune to the biases and self-interest exhibited in private settings. Government has no special superiority in deciding when the stock market is in a bubble to be pricked, or when it is time to administer economic Prozac<sup>TM</sup> to counteract market pessimism. Indeed, the economic incentives of officials to overcome their biases in evaluating fundamental value are likely to be weaker than the incentives of market participants. So government efforts to correct market perceptions are likely to waste resources and increase ex ante uncertainty. In sum, advocates of laissez faire who rest their case on market efficiency are in some respects needlessly vacating the high ground of the debate without clash of arms.<sup>3</sup>

This is not to say that market inefficiency is devoid of implications for policy. Mispricing can cause some classes of foolish investors to do worse than a ‘dartboard’ portfolio, wasting money on stale fads or on securities marketed to the ignorant.

We argue that limited attention and processing capacity creates a general problem of *investor credulity*. Several studies (discussed in Sections 2–4) provide evidence suggesting that investors and analysts on average do not discount enough for the incentives of interested parties such as firms, brokers, analysts, or other investors to manipulate available information. There is evidence that investors in many contexts do go beyond superficial appearances and make some adjustment for systematic biases in measures of value such as accounting earnings. However, cognitive limitations make it hard to make the appropriate adjustments uniformly and consistently.

Investor credulity and systematic mispricing in general suggest a possible role for regulation to protect ignorant investors, and to improve risk sharing. The potential for improvement does not imply that government activism will help. The political process is subject to manipulation by interest groups, and political players have self-interested motives. So a global default of laissez faire is superior to a hair-trigger readiness to bring the coercive power of government into play. We do suggest that investor education, disclosure rules, and reporting rules designed to make financial reports consistent and easy to process may be helpful. Designed correctly, such policies may infringe relatively little on individual freedom of choice. More controversial may be restrictions on financial advertising and rules that limit investors’ freedom of action. The potential benefits of government policy at its best is that it can help investors make better decisions, and can improve the efficiency of market prices. But much regulation already exists for these purposes. Academic study based on psychological biases may support new regulation, but may also determine that some existing regulations and activities are counterproductive. Just as much as if markets were perfectly efficient, government can do great good simply by doing no harm.

The remainder of the paper is structured as follows. Section 2 describes evidence on the behavior of investors and analysts. Section 3 examines whether investor biases

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<sup>3</sup>There has been very little analysis of welfare when both privately acting individuals and voters or government officials are imperfectly rational. Krussell et al. (2000) describe a setting in which an imperfectly rational government reduces welfare relative a competitive equilibrium among similarly irrational private individuals.

affect asset prices. Section 4 examines evidence regarding whether firms exploit investor biases. Section 5 discusses the problem of excessive credulity by investors. Section 6 considers basic issues about how public policy should take into account the psychology of investors. Section 7 discusses implications for reporting standards, disclosure regulation, and financial advertising. Section 8 considers policies that limit firm and investor freedom of action. Section 9 concludes.

## 2. The behavior of investors and security analysts

In Sections 2 and 3, we examine the evidence as to whether and how imperfect rationality affects trading, expectations and prices in capital markets. Several recent surveys summarize evidence about psychology of the individual and its relevance for financial and other economists.<sup>4</sup> Here we primarily discuss psychological evidence in the context of the specific capital market phenomena to be explained. It has long been recognized that a source of judgment and decision biases is that cognitive resources such as time, memory, and attention are limited. Since human information processing capacity is finite, there is a need for imperfect decisionmaking procedures, or heuristics, that arrive at reasonably good decisions cheaply (see, e.g., Simon, 1955; Tversky and Kahneman, 1974). The necessary abbreviation of decision processes can be called *heuristic simplification*.

However, there are other possible reasons for systematic decision errors. In a recent review, Hirshleifer (2001) argues that many or most familiar psychological biases can be viewed as outgrowths of heuristic simplification, self-deception, and emotion-based judgments. Heuristic simplification helps explain many different documented biases, such as salience and availability effects (heavy focus on information that stands out or is often mentioned, at the expense of information that blends in with the background), framing effects (wherein the description of a situation affects judgments and choices), money illusion (wherein nominal prices affect perceptions), and mental accounting (tracking gains and losses relative to arbitrary reference points).

Self-deception can explain overconfidence (a tendency to overestimate ones ability or judgment accuracy), and dynamic processes that support overconfidence such as biased self-attribution (a tendency to attribute successes to one's own ability and failure to bad luck or other factors), confirmatory bias (a tendency to interpret evidence as consistent with one's preexisting beliefs), hindsight bias (a tendency to think you 'knew it all along'), rationalization (straining to come up with arguments in favor of one's past judgments and choices), and action-induced attitude changes of the sort that motivate cognitive dissonance theory (becoming more strongly persuaded of the validity of an action or belief as a direct consequence of adopting that action or belief); see Cooper and Fazio (1984).

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<sup>4</sup>See Camerer (1995,1998), DeBondt and Thaler (1995), Rabin (1998), Shiller (1999), and Hirshleifer (2001). Some of these papers offer responses to the criticisms that economists have frequently expressed about the relevance of psychological experiments for economic analysis.

Feeling or emotion-based judgments can explain mood effects (such as the effects of irrelevant environmental variables on optimism), certain kinds of attribution errors (attributing good mood to superior future life prospects rather than to immediate variables such as sunlight or a comfortable environment), and problems of self-control (such as difficulty in deferring immediate consumption — hyperbolic discounting; and the effects of feelings such as fear on risky choices).

We review in this section the evidence for systematic cognitive errors made by investors and by analysts. Then, in Section 3, we examine the extent to which these biases affect prices.

### 2.1. Investors

#### *Investors often do not participate in asset and security categories*

A focus on what is salient may cause investors to invest only in stocks that are ‘on their radar screens’. Non-participation may also be related to familiarity or ‘mere exposure’ effects, e.g., a perception that what is familiar is more attractive and less risky.

In the absence of transaction costs, mean/variance optimization implies participating in all asset and security markets. For many years prior to the rise of mutual funds and defined contribution retirement plans, participation in the U.S. stock market was very incomplete (e.g., Blume and Friend, 1975). Even now, many investors entirely neglect major asset classes (such as commodities, stocks, bonds, real estate), and omit many individual securities within each class. Investors are strongly biased toward investing in stocks based in their own home country.<sup>5</sup> There is more localized bias within Finland (Grinblatt and Keloharju, 2001a) and within the U.S. (Coval and Moskowitz, 1999; Huberman, 1999). Mutual funds tend to invest locally, and earn higher returns on their local investments (Coval and Moskowitz, 2001), which is consistent with either rational processing of private information or with limited ability to process public information. Investors with more social ties are more likely to participate (Hong et al., 2001). Another possible source of non-participation is aversion to ambiguity, as reflected in the Ellsberg paradox; for example, Sarin and Weber (1993) find experimentally that graduate business students and bank executives were averse to gambles with ‘ambiguous’ probabilities relative to equivalent lotteries, and that this aversion affected market prices.

Employees tend to invest in their own firm’s stocks and perceive this stock as low risk (Huberman, 1999). The degree to which they invest in their employer’s stock does not predict the stock’s future returns (Benartzi, 2001), suggesting that the investment is not based on superior inside knowledge of their own firm.

#### *Individual investors exhibit loss-averse behavior*

Owing to limited attention and mental processing power, individuals engage in mental accounting (Thaler, 1985), which can lead them to confuse the unpleasantness of experiencing an economic loss with the unpleasantness of realizing the loss. This is related to the notion of loss-aversion (see, e.g., Tversky and Kahneman,

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<sup>5</sup>Cooper and Kaplanis (1994), Kang and Stulz (1997), Lewis (1999), Tesar and Werner (1995).

1991), in which individuals are concerned about gains and losses as measured relative to an arbitrary reference point. These psychological effects help explain the disposition effect, as confirmed by several studies of behavior in field and experimental markets — investors are more prone to realizing gains than losses.<sup>6</sup>

Specifically, Odean (1998a) shows that the individual investors trading through a large discount brokerage firm tend to be more likely to sell their winners than their losers. Moreover, he shows that the stocks that investors choose to sell subsequently outperform the stocks that investors retain. A substantial amount of the underperformance of the losers relative to the winners derives from the momentum effect, but momentum does not appear to explain all of the underperformance of these investors. Interestingly, the individual investor behavior that Odean observes goes against the investing maxim: “ride your winners and sell your losers”. The investing maxim may be designed as a corrective to individual biases.

An open question is who is taking the opposite side of these individual investors’ transactions. There is some evidence consistent with institutional investors (e.g., mutual funds) buying high momentum stocks and selling low momentum stocks, though as yet there is no direct evidence linking the sales of individual investors to the purchases of mutual funds. Also, more work is needed to complement the work on individual sales of stocks examining what forces cause individual investors to *purchase* common stocks. One relevant datum is that there are large flows into mutual funds which have experienced good past performance.

Home sellers also appear to be loss-averse in the way that they set prices. Their reluctance to sell at a loss relative to past purchase price helps explain the strong positive correlation of volume with price movements (Genesove and Mayer, 2001).

#### *Investors use past performance as an indicator of future performance in mutual fund and stock purchase decisions*

Representativeness (a tendency to judge likelihoods based upon naive comparison of characteristics of the event being predicted with characteristics of the observed sample) suggests that investors will sometimes extrapolate past price trends naively. Sirri and Tufano (1998) provide evidence that flows into mutual funds are concentrated among those funds which have had extraordinarily high performance. This evidence suggests that investors are naively extrapolating past mutual fund success, when empirical evidence suggests that there is little or no persistence in performance (Grinblatt et al., 1995; Carhart, 1997). The fact that the flows are concentrated among the top performing mutual funds in each category is potentially consistent with limited attention/salience effects. Chevalier and Ellison (1997) and Brown et al. (1996) find that mutual funds alter their risk taking behavior in response to this flow performance relationship.

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<sup>6</sup>Shefrin and Statman (1985), Ferris et al. (1988), Odean (1998a), Weber and Camerer (2000), Lipe (2000) and Grinblatt and Keloharju (2001b). However, traders in small-cap stocks seem to exhibit a reverse-disposition effect (Rangelova (2000)). Also, Grinblatt and Keloharju (2000) and Choe et al. (1999) provide evidence that certain classes of investors engage in momentum (or positive feedback) trading and others in contrarian trading.

Consistent with the mutual fund evidence, Benartzi (2001) finds that employees allocate 401(k) retirement savings to investment in their own firm's stock based on how well that stock has done over the last 10 years. As discussed earlier, these allocations do not predict future performance.

#### *Investors trade too aggressively*

It has been argued that the volume of trade in speculative markets is too large, and overconfidence of traders has been advanced as an explanation (e.g., DeBondt and Thaler, 1995). Whether volume is too large is hard to establish without a benchmark rational level of volume. Rational dynamic hedging strategies, in principle, can generate enormous volume with moderate amounts of news.

Stronger support for overconfidence is provided by evidence suggesting that more active investors earn lower returns as a result of incurring higher transaction costs (Odean, 1999; Barber and Odean, 2000). Barber and Odean (2001) show that males trade more aggressively than females, incur higher transaction costs, and consequently earn lower (post-transaction cost) returns. Also consistent with overconfidence, traders in experimental markets do not place enough weight on the information and actions of others (Bloomfield et al., 1999). In experimental markets, investors also tend to overreact more to unreliable than to reliable information (Bloomfield et al., 2000).

Barber and Odean (1999) find that investors who have experienced the greatest past success in trading are the most likely to switch to online trading, and will trade the most in the future. This evidence is consistent with self-attribution bias, meaning that the investors have likely attributed their past success to skill rather than to luck. Also, there is some evidence that access to internet trading appears to encourage more active trading (Choi et al., 2000).

#### *Investors make blatant errors*

Longstaff et al. (1999) report large errors are made by investors in exercise policy of options. Consistent with limited attention, investors sometimes fail to exercise in-the-money options at expiration, which should affect the pricing of options by rational individuals. Rietz (1998) reports that some prevalent and persistent arbitrage opportunities are virtually never exploited by subjects in the Iowa political stock markets.

Investors are subject to the status quo bias in their retirement investment decisions; Madrian and Shea (2000) found that people tend to stick to the default offered by their firm in deciding on 401(K) participation and saving. This is consistent with investors having limited attention and processing power, and with their interpreting the status quo option as an implicit recommendation. Many investors diversify in their retirement plans naively, for example by dividing their contributions evenly among the options offered (Benartzi and Thaler, 2001). Thus, if more stock funds options are available, people overweight equity in their portfolio. Furthermore, people seem to treat investment in their own company in a separate mental account, so that for pension plans that allow this option, people invest substantially in their own firm while still maintaining a proportion between other stocks and bonds similar to the choices of investors in plans that do not allow this option.



*Investors do not always form efficient portfolios*

More generally, there is evidence that investors sometimes fail to form efficient portfolios. Several experimental studies examined portfolio allocation when there are two risky assets and a risk-free asset and returns are distributed normally. People often invest in inefficient portfolios that violate two-fund separation, though trained MBA students do better.<sup>7</sup>

*Certain classes of investors and their agents change their behaviors in parallel*

This phenomenon, called herding, is consistent with rational responses to new information, agency problems or conformity bias; Devenow and Welch (1996) and Bikhchandani and Sharma (2000) review literature on financial herding. Herding behavior has been documented in the trading decisions of institutional investors,<sup>8</sup> in recommendation decisions of stock analysts (Welch, 2000), and in investment newsletters (Graham, 1999; but see also Jaffe and Mahoney, 1999). The tendency of analysts to follow the prevailing consensus is not stronger when that consensus proves to be correct than when it is wrong (Welch, 2000).

*The trades of some investors are influenced by whether stocks are trading at an historical high or low*

This finding suggests that investors may form theories of how the market works based upon irrelevant historical values, somewhat analogous to making decisions based upon mental accounting with respect to arbitrary reference points.

## 2.2. Security analysts

*Analyst forecasts and recommendations are biased*

Analyst forecasts and recommendations have investment value (see Section 3.1). Nevertheless, there is strong evidence that analysts are biased in their forecasts and recommendations. It is likely that agency problems, analyst misperceptions and investor gullibility play a role in generating biases. Stock recommendations are predominantly buys over sells, by a seven to one ratio (e.g., Womack, 1996). Forecasts are generally optimistic especially at 12-month and longer time horizons, both in the U.S. and other countries (see e.g., Capstaff et al., 1998; Brown, 2001). More recent evidence indicates that analysts' forecasts have become pessimistic at horizons of 3 months or less before the earnings announcement (Brown, 2001; Matsumoto, 2001; Richardson et al., 2000).<sup>9</sup>

<sup>7</sup>Bossaerts et al. (2000), Kroll et al. (1988a, b), Kroll and Levy (1992).

<sup>8</sup>Foreign investors in Korea (Choe et al., 1999); mutual funds (Grinblatt et al., 1995; Wermers, 1999); individuals and institutions (Grinblatt and Keloharju, 2000); pension funds (Lakonishok et al., 1992; Nofsinger and Sias, 1999).

<sup>9</sup>In lone dissent, Keane and Runkle (1998) conclude that there is no bias in analysts' forecasts. However, their GMM approach to control for correlations in forecasts requires a long enough time series to estimate the correlations. This reduces the test power owing to decrease in sample size, and excludes firms for which bias is likely to be most important; those with low analyst following, high leverage and greater uncertainty. Although it seems unlikely that bias would vanish in a broader sample, the paper remains a useful critique of previous tests, and suggests that further study will be useful.

Biases may result from agency problems, such as incentives of analysts to ingratiate themselves with management to maintain access to information (e.g., Lim, 2001), to benefit the corporate finance side of the investment bank (Michaely and Womack, 1999), to enhance stocks held in-house by the brokerage firms (Irvine et al., 1998), to support the price of firms in which they own shares, and to stimulate investors to trade (Kim, 1998; Hayes, 1998). While there is some evidence to support the agency explanation,<sup>10</sup> there is also evidence to support a psychological explanation for the forecast bias.

Forecast optimism is also observed for indices, where presumably agency incentives are weaker (Darrough and Russell, 2000). Das et al. (1998) and Lim (2001) find that forecast bias is higher for firms with greater uncertainty and information asymmetry, and interpret the evidence as supportive of greater analysts' incentives to obtain access to managers for information. However, greater uncertainty and information asymmetry also increases the scope for psychological biases to exert themselves. Eames et al. (2000) suggest that forecast optimism is the result of unconscious justification of favorable stock recommendations. Experimental studies suggest that analysts' forecast bias result from unintentional cognitive bias; Affleck-Graves et al. (1990) and Libby and Tan (1999) show that analysts are affected by simultaneous versus sequential processing of the same information signals, and Tan et al. (2000) show that analysts forecasts are higher for firm's that lowball pre-announcements of earnings.

*Analyst forecast errors are predictable based upon past accruals, past forecast revisions and other accounting value indicators*

The presence of systematic bias suggests inefficient forecasts and predictable forecast errors. Abarbanell and Bushee (1997) find that past accounting fundamental ratios predict forecast errors. Teoh and Wong (2001) find that past accounting accruals, the adjustments firms make to cash flows to obtain reported earnings, predict forecast errors for new issue firms and more generally in firms where earnings have been managed upward by taking high accruals. Analysts' overoptimism about new issue firms, therefore, contributes to the new issue anomaly. These findings suggest that investors are excessively credulous about the motives of management, perhaps because of limited attention — see the discussion in Section 5.

It is not clear in general whether analysts underreact or overreact to information. DeBondt and Thaler (1985, 1987, 1990), LaPorta (1996), and DeChow and Sloan (1997) conclude that analysts overreact to the information used in making long-term forecasts, and Elton et al. (1984) report that analysts are overly optimistic about firms that are doing well. On the other hand, Abarbanell and Bernard (1992), Shane and Brous (2001), and Liu (1999) report that analysts underreact to information.

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<sup>10</sup> For example, analysts who do corporate finance work issue recommendations for their clients that are especially optimistic (e.g., Lin and McNichols, 1998; Michaely and Womack, 1999). The evidence for forecasts, however, is mixed; some studies find an affiliation effect (Rajan and Servaes, 1997; DeChow et al., 2000), whereas others do not (Dugar and Nathan, 1995; Lin and McNichols, 1998; Teoh and Wong, 2001).

Analysts seem to revise their forecasts too conservatively (see, e.g., Lin, 2000a, b), e.g., upward revisions are low compared to subsequent earnings, suggesting an underreaction to new information. Easterwood and Nutt (1999) find that analysts appear to underreact to unfavorable information but overreact to favorable information. The underreaction to relatively shorter-term forecasts (within a year) is consistent with the post-earnings announcement drift in stock returns and short-term momentum in returns, whereas the overreaction to longer-term forecasts is consistent with long-term reversals in returns. See Section 3.1 for further discussion on pricing effects of analyst bias.

### 3. Do investor biases affect asset prices?

We review the evidence of whether errors made by individuals, institutional investors, and analysts affect security prices. We first examine predictability of security returns. Next, we discuss the calibration of equity expected returns and interest rates with consumption levels and variability — the equity premium and associated puzzles. Finally, we discuss the efficiency of information aggregation by markets when investors make cognitive errors.

In interpreting the evidence on predictability of returns, healthy skepticism is recommended because potential post-selection bias may create the illusion of significance. Sufficient data dredging can lead to apparent profit opportunities which are, in fact, not robust. However, this justifies only a degree of skepticism about evidence of return predictability. Both psychological and purely rational theories of asset pricing generally imply that returns are predictable.

The striking thing about the evidence we will discuss is that most reasonable conditioning variables, whether past returns, variables containing current prices, accounting variables, or analyst forecasts, turn out to be predictors of future returns. Although we cannot be conclusive about the sources of these patterns, there seems to be some consistent international patterns (e.g., low prices imply high future returns, and short-lag continuation is corrected by long-lag reversal). The consistency of these patterns suggests either that they reflect rational risk premia, or that there are psychological effects that have been slow to be arbitrated away.

A consistent pattern confirmed out of sample across different times and in different circumstances lends confidence that there is a robust underlying cause, but mutable patterns can be authentic as well. The covariance structure underlying rational risk premia can shift, and mispricing patterns certainly need not be eternal.<sup>11</sup> Indeed, there can be problems of reverse-datasnooping if specifications are searched until one that eliminates the effect in question is located.

Occasionally it is argued that since several empirical anomalies have vanished, psychological effects are at best only of transient importance. The size and January effects are often mentioned in this regard, and recently Schwert (2001) has pointed to a fairly recent 5-year period in which the value effect was not evident. However, the

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<sup>11</sup>For brevity, we almost entirely omit evidence on seasonalities in returns; see e.g., the reviews of Hawawini et al. (2000) and Hawawini and Keim (1995).

disappearance of an effect that has been confirmed over long time periods internationally, were it to occur, would be very discouraging for market efficiency unless we could clearly identify a shift in covariance with consumption consonant with the shift in expected returns.

More generally, there is an implicit view of the world that the capital markets are destined to march steadily to nearly perfect market efficiency as smart investors pick off detected anomalies one by one. We believe this view is naive, for three reasons. First, the process of picking off predictability patterns is itself erratic and prone to under- and over-reactions. If investors are irrational, they may trade based on the misperception that they have identified an anomaly, creating genuine mispricing. Second, since it is hard for an arbitrageur to guess what other arbs are doing, there is a coordination problem among arbitrageurs which can cause them to underexploit or to overexploit mispricing patterns (Daniel and Titman, 1999). This creates the possibility that patterns of predictability persist, or that they reverse. Third, owing to limited attention, as one set of inefficiencies are removed (or overexploited) others are likely to pop up. In this fallible human process, improvements in information processing technology should help, but will not be a panacea.

It is to the credit of the fully rational, frictionless, modelling approach that it is committed to sharp implications. Unfortunately, we will argue that these are in large part disconfirmed by the data. Existing psychology-based models also make some sharp predictions, but there is reason to suspect that these models are too absolute in their predictions, in that these models generally do not take into account the effects of popular learning about anomalies (as with the publicity received by the size effect in the late 1980s).

As discussed in Section 1, several reasons have been proposed as to why mispricing effects may be highly persistent. These ‘limits to arbitrage’ derive from the possibility that wealth flows from wiser to more foolish investors (see, e.g., the discussion in Hirshleifer, 2001). Existing models of psychology and the stock market would have permanent descriptive power if, in the long run, patterns of stock return predictability were to stabilize permanently. However, we suspect this is unlikely to occur. Individual learning about profitable trading strategies, and arbitrage activity can over time attenuate or reverse a given mispricing effect, or even (given the coordination problem mentioned above) strengthen it. We therefore suggest that a key challenge for future asset pricing models is to capture the process by which investors adopt new theories about market pricing.

Some of the return predictability patterns described below seem to be profitable net of transactions costs, and some are not. In either case these patterns present a challenge for scientific explanation, and are relevant for policy.

### *3.1. Predictability of asset and security returns*

Investor misperceptions can induce predictability even after accounting for rational measures of risk. Most of the patterns of return predictability summarized here have alternative (though not equally plausible) explanations based on either risk premia or mispricing.

In drawing conclusions about alternative hypotheses, empirical papers on predictability often interpret risk-based explanations more broadly than psychological ones, partly because psychology-based modelling is less fully developed. For example, evidence that a factor model or aggregate conditioning variables capture predictability is sometimes taken as opposing psychological explanations. But the psychological approach is consistent with the existence of factor risk premia — just because investors have psychological biases does not mean that they are neutral toward risk. Furthermore, mispricing of factors can generate factor-related expected return patterns. Fortunately, the two possibilities can be distinguished by measuring whether the return premium is commensurate with the risk. This requires calibration within an asset pricing model (Fama, 1970).

The same conditioning variables that are often interpreted as identifying risk factors (such as book/market, size, market dividend yield, the term premium, and the default premium) have natural interpretations as proxies for factor misvaluation. Thus, studies that apply such aggregate variables can be viewed as using measures of factor mispricing to predict the cross-section of future stock returns.

In the subsections that follow, we begin with direct risk proxies such as CAPM beta, and move on to variables that have alternative interpretations. The last subsection considers mood proxies that are hard to interpret as proxies for risk.

### 3.1.1. CAPM beta

To the extent that the risk measures suggested by purely rational models fail to predict returns as they should, some misspecification is suggested. However, even imperfectly rational settings can imply that investors dislike risk and diversify, so a failure of covariance risk to be priced would be a surprise for either approach. We discuss the pricing of CAPM beta and the risk factors of Fama and French (1993), and do not attempt to review the vast literature on multifactor pricing (see Campbell, 2000).

*In some studies CAPM beta is positively related to expected future returns, and in others it is not*

Most studies that examine the issue report a positive univariate relation between beta and expected returns. There are, however, exceptions, and a wide variety of different applications and methods (for example, domestic versus international, different countries, time periods, return measurement intervals, as well as adjustment for survivorship biases and other aspects of the empirical method; see, e.g., Hirshleifer, 2001 for references to this literature). Some studies find an incremental ability of beta to predict future returns after controlling for market value and/or fundamental/price ratios such as book/market, but some do not, depending on time, place, method, whether human capital is included in the market, and whether unconditional or conditional betas are used.

### 3.1.2. Other risk measures

*It is hard to explain the cross-section of securities returns based upon rational risk measures*

A number of multifactor models have been proposed to explain the size, book to market, and momentum effects (discussed in detail in Section 3.1.3 below). Perhaps

the best known of these is the Fama and French (1993) three-factor model. Fama and French (1996) show that the three-factor model does a relatively good job of explaining the returns of many anomalies, but cannot explain the returns to momentum-sorted portfolios. Carhart (1997) adds a fourth factor based upon momentum and finds that this model does a fairly good job of explaining momentum-sorted portfolio returns as well.

However, the fact that these returns can be explained by characteristic-based factors does not imply consistency with a rational model. As Daniel and Titman (1997) point out in the context of book/market, such factors can pick up mispricing as well as risk. Indeed, Daniel and Titman show that the Fama and French (1993) tests cannot discriminate between an ad hoc characteristics-based (mispricing) model and a model in which the constructed factors are true risk factors.

For the factors in these models to represent risk factors, it would have to be the case that the factor realizations have a strong covariance with investors' marginal utility across states. For example, the empirical evidence shows that growth (low book-to-market) stocks have had consistently low returns given their CAPM beta. For these low returns to be consistent with a rational asset pricing model, the distribution of returns provided by a portfolio of growth stocks must be viewed by investors as 'insurance'; it must provide high returns in bad (high marginal utility) states and low returns in good (low marginal utility) states.

There is a good deal of controversy over the issue of whether returns of size, book-to-market, and momentum portfolios contribute to consumption risk. Lakonishok et al. (1994) present evidence that, if anything, the returns of growth stocks are lower than those of value stocks in recessions. However, Liew and Vassalou (2000) present evidence that the returns on a portfolio based on book/market (and on size) are positively associated with innovations in the GDP growth rate in most of a set of 10 countries. In the U.S., this effect is not consistent across specifications. Over a longer 41 year U.S. sample, these variables have no significant ability to predict GDP growth.<sup>12</sup> They find little evidence to support the idea that momentum is a risk factor.

So far, research has focused primarily on the sign and the statistical significance of the correlations between the innovations in macroeconomic variables and portfolio returns. To evaluate the rational risk premium explanation for value and momentum effects, it is important to examine whether the magnitudes of these correlations (and covariances) are sufficiently large to explain the high Sharpe ratios of these portfolios.<sup>13</sup>

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<sup>12</sup>Several studies have found the book/market effect in Japan is extremely strong. Liew and Vassalou find that book/market does not predict GDP growth in Japan.

<sup>13</sup>Chen (2000) is one of the few papers to examine this question. He finds that book/market and momentum-based portfolios do not contain enough information about future market returns to be strongly priced as state variables in his specification of the Merton ICAPM, and therefore concludes that the ICAPM cannot explain the high mean returns on these portfolios (though it potentially can explain the mean returns of a size portfolio).

The high Sharpe ratios apparently achievable by strategies based on size, book to market, and momentum suggest that extreme preferences would be required to explain these returns, no matter how high the correlations. MacKinlay (1995) and Brennan et al. (1998) show that strategies based on these characteristics have extremely large Sharpe ratios. Also, the returns on these portfolios do not appear to have high correlations with macroeconomic variables that might proxy for marginal utility. Moreover, the international evidence suggests that the size, book-to-market and momentum returns are not highly correlated across countries (Hawawini and Keim, 1995; Fama and French, 1998; Rouwenhorst, 1998). This suggests that an internationally diversified size, book-to-market and momentum portfolios would achieve still higher Sharpe ratios than suggested by examining U.S. data alone. Taken together, this evidence seems to imply that a frictionless, rational model which would explain this evidence would have to have very unusual (and perhaps implausible) preferences to accommodate very large variability in marginal utility across states.

### 3.1.3. Price and comparison measures

One strategy for identifying asset mispricing is to seek a mismatch between an asset's market price and a related value measure. Such mismatches are often large. The better our benchmark measure of the security's true value, the stronger the indication of a mispricing. In many cases the size of the mismatch strongly predicts future returns, which suggests either that the mismatch has identified mispricing, or that it proxies for risk. Specifically, consistent with an overreaction story, relative mismatches can be used to predict price corrections in which the mismatch is reduced. Perhaps the most obvious possible source for such overreactions is investor overconfidence about their abilities to acquire or process information. However, numerous other psychological effects, such as representativeness and salience bias can potentially lead to overreactions and corrections.

The fact that apparent mispricing is in many studies stronger among small or thinly traded firms makes some researchers very skeptical of such findings (Fama, 1998). Apparent mispricing is also stronger among firms that do not have close substitutes (Wurgler and Zhuravskaya, 2000). However, it is to be expected that mispricing will often be stronger where it is harder to verify. If a mispricing is very easy to identify, investors will either price the stock correctly in the first place, or else smart and foolish investors will trade heavily against each other causing large flows of wealth away from the investors who were inducing the mispricing. However, evidence of mispricing is not limited to very fuzzy cases.

### *Firms are sometimes valued by the market as worth less than one division*

As just one interesting example, in the Palm/3-Com case discussed below, imperfect rationality on the part of many investors led to mispricing among close substitutes. Constraints on short-selling are what allowed such a blatant mispricing to persist. However, this evidence suggests that less blatant mispricing may be common.

Cornell and Liu (2000), Lamont and Thaler (2001), Mitchell et al. (2001) and Schill and Zhou (1999) describe several cases of parent firms valued by the market as being worth much less than one of their parts. Corporate transactions such as equity

carveouts seem well-suited as a means to exploit mispricing of divisions. In the case of Palm and 3-Com, the market value of the carved-out division (Palm) was greater than that of the entire firm (3-Com); the market's implicit valuation of 3-Com (without Palm) was -\$23 billion. This implies a dramatic overvaluation of Palm in blatant form, violation of the law of one price. Investors in Palm stock in effect paid more for a claim on Palm than they would have paid for the same claim via a purchase of 3-Com shares. Why did so many investors buy Palm shares instead of 3-Com? (Short interest in Palm was extremely high, meaning that there were a correspondingly large number of investors who were holding Palm rather than 3-Com.) Perhaps, at that time, some of the 5 million enthusiastic users of Palm devices and software chose to purchase Palm and did not notice the better deal available through the purchase of 3-Com. This suggests that the explanation for the mispricing lies partly in investor overconfidence and partly in salience/limited-attention effects. Lamont and Thaler (2001) and Mitchell et al. (2001) discuss in some detail why market frictions prevented arbitrageurs from eliminating the relative mispricing by shorting Palm and buying 3-Com.

*Closed-end funds trade at discounts and premia, with discounts being more common than premia*

Dimson and Minio-Kozerski (1998) survey evidence on the price behavior of closed-end funds. They argue that existing fully rational explanations do not explain the different aspects of this evidence. The noise trader theory, due to DeLong et al. (1990b) and Lee et al. (1991), is that the correlated trades of imperfectly rational investors create risk in the fund price above and beyond the riskiness of the underlying assets it holds. In consequence rational traders demand a risk premium for holding the fund.

*Closed-end fund discounts and premia predict future returns on small firms*

Swaminathan (1996) and Neal and Wheatley (1998) provide evidence of this.<sup>14</sup>

*Virtually perfect substitutes trade at different prices*

Rosenthal and Young (1990) and Froot and Dabora (1999) document that shares of Royal Dutch and of Shell are claims to proportional cash flows, but trade primarily in different countries and fluctuate widely in relative price. Each security acts as a value benchmark for the other.

*Long-term bond returns are positively predicted by the difference between long-term interest rates and the short-term rate, or based on the difference between the forward rate and the short-term spot rate*

This pattern has been confirmed in several studies.<sup>15</sup> In a rational world, long-term interest rates should reflect expectations of future short-term rates with adjustment

<sup>14</sup>Bodurtha et al. (1995) provide evidence consistent with irrational trading by U.S. investors inducing mispricing and later correction in U.S. small stocks, including country fund stocks. They find that U.S.-traded closed-end country fund premia and discounts are often large. Their comovement derives primarily from their common sensitivity to the U.S. market. Country fund stock returns and returns on U.S. size-ranked portfolios are predictable based upon country fund discounts and premia.

<sup>15</sup>Mankiw and Summers (1984), Mankiw (1986), Shiller et al. (1983), Fama and Bliss (1987), Campbell and Shiller (1991), Bekaert et al. (1997).



for risk premia. But if long-term bonds can be mispriced, the discrepancy between the price of a long-term bond (or a forward rate) and a safer short-term bond (which has less room for mispricing) is a possible measure of mispricing.

*Increases in a country's bond yield relative to another country's bond yield forecasts future appreciation of that country's currency*

This is the forward discount puzzle. This conflicts with the presumption that interest rate differentials reflect differences in expected inflation, and has proven to be hard to explain in terms of risk premia (see the surveys of Lewis, 1995; Engel, 1996). If instead the interest rate differential is viewed as a proxy for the relative mispricing of the two bonds, then a relative rise in one country's bond yield indicates excessively high expectations of inflation. When the error is corrected, the currency rises.

*Cross-sectionally, small market value and high fundamental/price ratios predict high stock returns in many countries, even after controlling for beta*

Size and fundamental/price ratio (e.g., book/market, earnings/price, cash-flow/price, sales/price, and debt/equity) anomalies have been documented in numerous papers, beginning with Banz (1981). Fama and French (1996) report that the book-to-market effect subsumes the earnings/price effect. However, Raedy (2000) reports that the cash-flow/price anomaly is not subsumed by the book/market and size effects when a comprehensive set of predictive variables are evaluated simultaneously.

Although value effects have been validated out of sample internationally and in different time periods, it is interesting that Schwert (2001) reports that during the period 1993–1998 there was essentially no value effect in dimensional fund advisors (DFA) portfolios. In fact, 1998–99 were the worst two consecutive years for value since 1930.<sup>16</sup> This suggests the possibility that as the value effect has been publicized, investors may have begun to view it as a 'good deal'. Such investor perceptions can correct, or even over-correct, a pattern of predictability. The low returns to size-based strategies in the 1980s and 1990s following publicity in the academic and professional finance literature, suggest a similar explanation. Whether the value premium will persist in the future (as would be predicted under a rational risk premium theory in a stable economic environment) remains to be seen.

Price-containing measures also reflect a risk discount. Both misvaluation and risk premia imply that stocks with low prices should earn high future returns. If risk is rationally priced the price-containing variable will help predict returns unless risk is controlled for perfectly (see, e.g., Ball, 1978; Keim, 1988; Berk, 1995). Size has no predictive power when it is measured by book value or other non-market measures (see Berk, 2000).

*For the stock market as a whole, high fundamental/price ratios (dividend yield or book/market) seem to predict high long-horizon stock returns*

For the stock market as a whole, the ability of high fundamental/price ratios (dividend yield or book/market) to predict future index returns in the U.S. and

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<sup>16</sup>This is based on the return to the Fama and French (1993) HML portfolio. However, the HML portfolio return was very strong in 2000.

internationally is mixed. Since fundamental/price ratios are persistent, the effective amount of modern data to test these relationships is limited, and full agreement as to statistical issues has not been reached.<sup>17</sup>

Lewellen and Shanken (2000) provide a model in which rational learning brings about a non-exploitable association between high dividend yield and high subsequent market returns. This is not a predictive relation, because it is only in the light of ex post data that individuals can determine whether an early dividend yield was high or low.<sup>18</sup> It is not obvious how strong such learning effects should be in the long run.

There is also evidence that stock market returns are predictable based on term spreads and default spreads (Keim and Stambaugh, 1986; Campbell, 1987; Fama and French, 1989), which also can be interpreted as mispricing proxies based on the deviation between a market price and another value benchmark, and based upon interest rate shifts (Campbell, 1987; Hodrick, 1992). There are other documented market predictors as well (see, e.g., Lettau and Ludvigson, 2001).

*There is a factor associated with book/market, but there is no clear evidence as to whether this factor earns a risk premium*

Fama and French (1993) find that size and value portfolios are imperfectly correlated with the market, and therefore reflect a common factor or factors distinct from the market factor (see also Fama and French, 1995). In a fully rational model (such as the static CAPM), this need not imply that the book/market factor receives a risk premium distinct from the market premium. However, such a factor or factors may represent hedges against shifts in the investment opportunity set, or hedges of non-tradable assets that are omitted from the market portfolio proxy. The loadings on three factor portfolios based on size, value and the market predict the returns on portfolios sorted on size, value measures and long-term past returns, but not short-term momentum (Fama and French, 1996). Fama and French (1993) extend their model to include maturity and default-related factors, and find that their five risk factors help to explain the returns on bonds as well as stock. Fama and French (1998) use a two factor model based on the world market portfolio and book/market to predict portfolio returns on global book/market and other portfolios, and country portfolios. Hodrick et al. (2000) extend the dynamic asset pricing model of Campbell (1996) and find that it does not explain the high returns on high book-to-market portfolios across countries.

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<sup>17</sup>Some recent studies include Bossaerts and Hillion (1999), Kothari and Shanken (1997), Goetzmann et al. (2001), and Goyal and Welch (1999).

<sup>18</sup>This, along with the general analysis of rational learning of Bossaerts (1996), emphasizes the importance of using rolling estimation methods. Lewellen and Shanken also show that learning can induce a cross-sectional association between value measures and subsequent returns, and that if priors about dividend growth are diffuse, the direction of prediction is consistent with the evidence. Intuitively, with diffuse priors, when people observe high dividends on a stock, they attribute this to very high growth rate on the stock, so yield falls. Eventually the high price must be corrected downward, so low yield is associated with low subsequent return. Presumably priors that are too precise instead of diffuse would lead to the opposite implication.

A popular interpretation of why rational investors would price the Fama/French size and book/market factors is that they are correlated with non-marketable risks of individuals who will be harmed when firms go into financial distress. Chan and Chen (1991) report evidence that highly leveraged and inefficient firms are responsible for the U.S. small firm effect. Leverage, dividend cuts, and earnings uncertainty help explain size and book/market effects in several countries (Chen and Zhang, 1998). On the other hand, in the U.S., Dichev (1998) reports that measures of bankruptcy risk are not positively associated with subsequent returns. Shumway (1996) finds that small size and low past returns forecast default, but that book/market is only weakly related to default risk. Griffin and Lemmon (2001) report that after controlling for distress, the book/market effect remains strong. Piotroski (2001) finds that the returns to a book/market investment strategy can be greatly increased by investing more heavily in financially *strong* high book/market firms.<sup>19</sup> A significant fraction of the stock return gains from this strategy are obtained at the dates of subsequent earnings announcements.

The tendency of firm employees to invest their retirement funds voluntarily in shares of their own firms (Benartzi, 2001) is puzzling from the perspective of standard portfolio theory, and particularly for the distress hypothesis of the value premium. For example, Benartzi (2001) report that Coca Cola employees allocate 76% of their *discretionary* 401(k) retirement investment to Coca Cola shares. Such behavior may result from a psychological preference for the familiar, the so-called ‘mere exposure’ effects.

*Investors are surprised by the good subsequent performance of value stocks and the poor performance of growth stocks*

Perhaps the most telling evidence that value effects are a result of expectational errors is that, after portfolios are formed, stock prices on average react far more positively for value stocks than for growth stocks at the dates of subsequent earnings announcements over a 5-year period (LaPorta et al., 1997). To be consistent with rationality, this would require implausible levels of covariance risk on earnings announcement dates. Bernard et al. (1997) draw a differing conclusion, but report mispricing based on earnings momentum.

*Accounting ratios provide additional power to predict returns*

Earnings and book value are crude measures of firm value. Even better performance in predicting cross-sectional, aggregate, and international returns are achieved using indicators derived from accounting numbers. Many investors use such strategies, which fall into three main classes: fundamental ratio analysis, accruals analysis, and fundamental value analysis.

The trading strategy based on fundamental ratio analysis uses composite scores computed from accounting financial ratios to form portfolios (Ou and Penman, 1989; Holthausen and Larcker, 1992; Lev and Thiagarajan, 1993; Abarbanell and Bushee, 1998). Large abnormal returns in the year subsequent to portfolio formation can be achieved. For example, Abarbanell and Bushee (1998) find that returns can be predicted

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<sup>19</sup>The benefits are greatest in small and medium-sized firms with no analyst following, but do not depend on buying firms with low share prices.

using portfolios formed based on growth rates in inventories, accounts receivables, gross margins, selling expenses, capital expenditures, effective tax rates, inventory methods, audit qualifications, and labor force sales productivity. A substantial portion of the abnormal returns occur around subsequent earnings announcement dates.

*Accruals (adjustments to accounting earnings) are negative predictors of future stock returns*

Earnings reported on firms' financial statements differ from cash flows by accounting adjustments known as accruals. These are designed, in principle, to reflect better the economic circumstances of the firm. These accruals are found to have strong predictive power for stock returns; high accruals predict negative long-run future returns (Sloan, 1996; Teoh et al., 1998a, b; Rangan, 1998; Chan et al., 2000a; Xie, 2001). These effects are independent of the book/market and size effects, are strongest for discretionary working capital accruals, and are present during issuance of new equity (both IPOs and SEOs); see e.g., Teoh et al. (1998a, b). One interpretation is that investors are fixated on earnings numbers, and so underestimate the transitory nature of accruals and the degree that the accruals have been managed to bias reported earnings upwards. Analysts similarly fail to discount appropriately for the level of accruals (Teoh and Wong, 2001), suggesting that they are either fooled or choose to act as if they are fooled by earnings management.

*Constructed fundamental value indices predict future stock returns*

Another approach relies on deviations of stock prices from an imputed value based on a fundamental value model. Ohlson (1995) provides a residual income model which values stock as the sum of book value and the discounted value of expected future residual earnings, defined as earnings in excess of the normal return on capital employed in future years. In practice, earnings forecasts are often used as proxies for expected earnings. Using the Ohlson model, Frankel and Lee (1998) find that the ratio of a value index that uses analyst consensus earnings forecasts to price has incremental power to predict returns beyond book/market. Frankel and Lee (1999) find that such an index applied internationally produces abnormal returns in a cross-country investment strategy. Chang et al. (1999), DeChow et al. (1999), Lee et al., (1999), and Piotroski (2001) also describe profitable trading strategies based on comparing stock prices to stock prices predicted by the residual income model.

An interesting aspect of this approach is that the fundamental measure is based on analyst forecasts (a measure of expectations). If analysts and investors share similar misperceptions, this should tend to wash part or all of the mispricing from the residual income measure of misvaluation. In the extreme, the discrepancy between the market price and the fundamental measure would not capture any mispricing. This suggests that the potential predictability of returns is even greater than these studies would indicate.

The mispricing measure, therefore, is capturing either: (1) errors that investors make which analysts do not make, (2) similar errors made by both investors and analysts, but which are more extreme for investors, or (3) that investors extrapolate long-term earnings in a more extreme manner than is assumed in the implementation of residual income valuation models.

### 3.1.4. Momentum and long-run reversal

*There are positive short-lag autocorrelations and negative long-lag autocorrelations in many asset and security markets*

The value effects described earlier reflect long-lag reversal. Cutler et al. (1991) report significant positive short-lag autocorrelations for gold, bonds, and foreign exchange at lags of several weeks or months, with negative autocorrelations at horizons of a few years. They find positive monthly autocorrelations in the 13 stock markets they examined. Short-run momentum profits across 23 stock market indices are reported by Chan et al. (2000a), Bhojraj and Swaminathan (2001) and Chui et al. (2000) report momentum and later reversal. Long-run aggregate stock market reversals have been documented in both the U.S. and in foreign stock markets.<sup>20</sup>

Several theories have been offered to explain this pattern. According to Daniel et al. (1998), investor overconfidence causes overreaction to private signals, implying long-run negative autocorrelation. Self-attribution bias causes overreactions to continue as later information arrives. This smooths the average path of overreaction and correction, causing short-term positive autocorrelations. In Barberis et al. (1998), investors are subject to a conservatism bias which causes them to underreact to earnings and other corporate news, causing short-lag positive autocorrelations; but when they observe trends of rising earnings representativeness causes them to switch to overreaction, causing long-lag negative autocorrelation. In Hong and Stein (1999), investors who focus only on fundamentals and ignore the market price cause underreaction, and investors who focus only on market price follow price trends and induce overreactions. Grinblatt and Han (2001) provide a model in which, owing to the disposition effect, a stock that has fallen does not fall enough and tends to time to correct; a stock that has risen tends not to rise enough, and again takes time to correct.

In evaluating these alternative hypotheses, it is necessary to consider the full range of implications of each approach. For example, Daniel et al. (1998) and Barberis et al. (1998) offer as further implications of their approaches the phenomenon of post-announcement abnormal returns found in many event studies; Daniel et al. (2001) and Barberis et al. (1998) argue that their approaches explain cross-sectional value-growth effects; and Daniel et al. (2001) suggest that overconfidence can explain the weakness of beta in predicting returns when variables such as book/market are included as predictors as well. Each of these models offers several other ancillary implications, some tested and some as yet untested; Hirshleifer (2001) discusses the testing of these theories in more detail. More recently, Grinblatt and Han (2001) predicts that the larger (more positive) the 'capital gain overhang' in a stock, defined as the percentage gap between its current price and a reference price determined by past trading behavior, the higher will be its expected return. They report strong empirical confirmation for this prediction. In contrast with the above-mentioned models, the Grinblatt/Han model does not seem to imply long-lag reversal.

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<sup>20</sup>See, e.g., Fama and French (1988), Poterba and Summers (1988) and Richards (1997); although methodological issues have been raised, the results seem to be fairly robust.

*Cross-sectionally, there is strong short-run momentum and long-run reversal. The Sharpe ratios achievable through U.S. momentum strategies appear to be too large to be consistent with a rational frictionless model*

Cross-sectionally, U.S. stocks that have done very well relative to the market in the past tend to do so in the future as well, based on the past 3–12 month holding period (Jegadeesh and Titman, 1993). Momentum is strongest in the performance extremes. The abnormal performance tends to reverse after about 4–5 years (Lee and Swaminathan, 2000b; Jegadeesh and Titman, 2001). Momentum effects are present in both European countries (Rouwenhorst, 1998) and emerging markets (Rouwenhorst, 1999). While there is evidence of a strong book/market effect in Japan, there is little or no evidence of a momentum effect (Haugen and Baker, 1996; Daniel et al., 2001). Reversals in the cross-section were documented by DeBondt and Thaler, 1985; although methodological issues have been raised (e.g., Ball and Kothari, 1989; Ball et al., 1995; Chan, 1988), the effect seems to be real (Chopra et al., 1992). Momentum seems to exist in the non-market component of returns; certain portfolios of stocks exhibit negative autocorrelations at the relevant lags (Lewellen, 2000). Regarding the magnitude of the Sharpe ratios, see Chen (2000) and the discussion in footnote 13 above.

*The momentum effect is strongest in small firms*

Momentum is stronger in small than in large firms (Jegadeesh and Titman, 1993; Grinblatt and Moskowitz, 1999), in growth than in value firms (Daniel and Titman, 1999), and in firms with low rather than high analyst following (Hong et al., 2000). These tendencies are potentially consistent with limits to attention reducing the extent to which investors take advantage of momentum. Also, it suggests that smart investors may be more deterred by transactions costs than foolish investors.

Both industry and non-industry components of momentum help to predict future returns (Grundy and Martin, 2001; Moskowitz and Grinblatt, 1999). Moskowitz and Grinblatt find that the profitability of industry momentum comes mainly from winners, but the profitability of individual stock momentum strategies is stronger for losers. At long horizons, momentum reverses. Grundy and Martin (2001) examine industry and other factors and find stronger momentum in the security-specific (non-market) component of stock returns than in the total return. They further find that the profitability of momentum strategies is not a mere consequence of their picking long positions in stocks with high, constant, expected returns. Griffin et al. (2001) do not find any clear relation between momentum and macroeconomic conditioning variables.

*Momentum is associated with subsequent abnormal performance at earnings announcement dates*

It is hard to reconcile the strength of the momentum effect with full rationality, especially since momentum seems to be at least partly caused by biased investor forecasts of earnings. Past winners earn higher returns than do past losers at the dates of quarterly earnings announcements occurring in the 7 months following portfolio formation Jegadeesh and Titman (1993); see also Chan et al. (1996). The

returns on these few dates account for about a quarter of the gains from the momentum strategy over this holding period. Firms with extremely low returns over the preceding 12–18 months tend to be having difficulty. In contrast with the distress factor interpretation of book/market effects, such negative momentum firms earn low instead of high future returns.

Lee and Swaminathan (2000b) find that volume interacts with momentum and reversal in a fashion consistent with a cycle of overreaction and correction. Lewellen (2000) provides evidence of *negative* autocorrelation in industry and size portfolios. This suggests that the stock market was negatively autocorrelated at the relevant lags during the time period he examined. Using the decomposition of Lo and MacKinlay (1990), he ascribes momentum profits to a lead-lag relationship between returns on different securities.

Serial correlations in returns are subject to alternative psychological interpretations. Lo and MacKinlay (1990) offer a decomposition, also applied by Brennan et al. (1993) and Lewellen (2000), which shows that the expected profit from a contrarian or momentum trading strategy is related to the cross-serial covariances of security returns. This 'lead-lag' term can be interpreted as measuring whether some stocks react to information more quickly than others. On the other hand, a factor such as the market that misreacts to information and then corrects also induces cross-serial correlations even if all stocks react to information equally quickly. If the market overreacts and then corrects, and if all stocks have a beta of 1, then today's return on a stock will be negatively correlated with the past returns on other stocks. Thus, a given cross-serial covariance structure is potentially subject to very different causal interpretations. Jegadeesh and Titman (1995) provide a decomposition that distinguishes factors from residuals, and therefore lends itself to factor-based interpretation.

Several papers report that commercial and residential real estate price movements are predictable based on past price movements in real estate or stock markets (Barkham and Geltner, 1995, 1996; Case and Shiller, 1990; Gyourko and Keim, 1992; Meese and Wallace, 1994; Mei and Liu, 1994; Ng and Fu, 2000). Credit constraints provide a possible explanation in residential markets (Spiegel and Strange, 1992; Lamont and Stein, 1999).

### 3.1.5. *Private signals and public news events*

A typical finding in modern event studies is that significant abnormal returns occur conditional upon corporate events. From a misvaluation perspective, this could have two very different explanations. The first possibility, event selection (modelled in Daniel et al., 1998), is that a firm's decision whether and when to undertake the action depends on whether there is market misvaluation. (This is often called 'timing'.) The second possibility is manipulation: near the time of the corporate action the firm alters the other information it reports publicly in order to *induce* misvaluation. The common use of the term 'timing' is potentially misleading, because event selection may be a matter of *whether* rather than *when* to take the action. More importantly, the possibility of manipulation is often ignored. There is evidence supportive of both selection and manipulation.

*Stock returns after discretionary corporate events exhibit post-event continuation*

The average abnormal stock returns in the 3–5 years following a corporate event have the same sign as the event-date stock price reaction. This post-event return continuation hypothesis is confirmed for many corporate events (see references in Hirshleifer, 2001),<sup>21</sup> and was proposed by Daniel et al. (1998) as resulting from investor over-confidence.<sup>22</sup> A common theme of these events is that they are taken at the discretion of management.

Private placements, on the other hand, are an exception that proves the rule in that they involve a discretionary choice not just by management, but also by the private purchaser. The purchaser has the opposite incentive, to buy when the stock is *undervalued*. There is little literature on post-event performance for events that are not taken at the discretion of management (or other individuals with incentives to react to mispricing). Cornett et al. (1998) find that there is post-event continuation when bank stocks issue equity, *except* when equity issuance is forced by reserve requirements.

Daniel et al. (1998) offer an explanation based upon investor overconfidence, combined with a tendency for management to take actions in response to market mispricing. An alternative explanation is that investors underreact to one-time news events in general, as in the conservatism explanation of Barberis et al. (1998). These explanations can be distinguished empirically by examining post-event stock performance for events that are not discretionary with management, such as regulatory changes.

Fama (1998) argues that anomalous post-event return patterns are likely to be artifacts of faulty methodology. Several recent studies of the new issues puzzle have used alternative methods that have led to qualified conclusions, or even to rejection of the hypothesis that new issue firms underperform.<sup>23</sup> However, Loughran and Ritter (2000) argue that the methods used by some recent studies minimize the power to detect possible misvaluation effects.<sup>24</sup> For example, abnormal returns calculated relative to a Fama/French factor benchmark capture only the residual misvaluation effect beyond that captured by market value and book/market. The risk factors selected are motivated by their return-predicting power established in previous

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<sup>21</sup> These include equity carveouts, spinoffs, tender offers, open market repurchases, stock splits, dividend omissions, dividend initiations, seasoned equity and debt offerings, public announcements of insider trades, venture capital distributions, and accounting write-offs. There is evidence suggesting that abnormal performance differs after private information arrival versus after public information events (Chan, 2000). There is also evidence of differing abnormal post-event performance after equity-financed versus cash acquisitions (Loughran and Vjih, 1997), although a direct comparison of post-event abnormal returns with event-date returns is not made.

<sup>22</sup> The post-event continuation hypothesis should not be confused with the hypothesis discussed by Fama (1998) that pre-event returns be of the same sign as post-event returns, which is not an implication of Daniel et al. (1998) and which, as he points out, is not supported by the data.

<sup>23</sup> See Brav et al. (2000), Eckbo and Norli (2000), Eckbo et al. (2000), Gompers and Lerner (2000), and Mitchell and Stafford (2000).

<sup>24</sup> Other papers that discuss and analyze methodological issues for the measurement of long-horizon abnormal performance in event studies include Barber and Lyon (1997), Fama (1998), Kothari and Warner (1997), and Lyon et al. (1999).



literature. Most importantly, the factor loadings often have dual risk and mispricing interpretations (Daniel et al., 2000). Thus, the alternative methods cannot exclude misvaluation effects, but can test only whether there is misvaluation above and beyond the misvaluation already implicit in the factors selected.

Loughran and Ritter (2000) further argue that the alternative methods weight observations by market value, which dilutes the importance of small firms which are arguably more subject to misvaluation. Using a benchmark contaminated with sample firms also biases results toward zero. Jegadeesh (2000) reports economically substantial underperformance relative to several alternative benchmarks, and for both large and small firms, indicating that SEOs may be misvalued above and beyond any misvaluation reflected in their book/market or market value. Furthermore, he documents misspecification in the three- and four-factor models used in recent papers. Finally, with many studies trying a variety of different factors, there is a further concern that unintentional factor-dredging can lead to spurious results. Thus, it is not obvious whether benchmark differences explain the different conclusions of these studies.

The magnitude of the abnormal returns may provide a feel for whether risk factors can explain the return differential. The argument that post-IPO underperformance is eliminated by an appropriate benchmark seems counterintuitive, because it amounts to saying that IPO firms have unusually *low* risk. For SEOs, the unadjusted post-SEO returns found by Eckbo et al. (2000) are larger than those found by Loughran and Ritter (1995) and Jegadeesh (2000). It would be surprising that factor risk pricing would explain such a high differential in expected returns (8% per year). Eckbo et al. (2000) point out that equity issuance reduces risk and the benchmark return; their six-factor model eliminates abnormal performance. But risk-reduction does not explain why there is poor stock return performance following seasoned *debt* issues (Spiess and Affleck-Graves, 1999), or after bond rating downgrades (Dichev and Piotroski, 2001). (These findings are also puzzling for the distress-risk-factor theory of return predictability.) It is also interesting that the equity share in total new issues predicts poor future performance of the U.S. stock market (Baker and Wurgler, 2000).

*Investor expectations and analyst forecasts about seasoned equity offering firms are favorably biased, and the long run post-event abnormal returns of these firms are associated with correction of these biases*

The most compelling reason to believe that post-SEO abnormal performance is a real phenomenon is some fairly direct evidence that investor expectations are systematically mistaken. New issue firms perform especially badly at subsequent earnings announcement dates relative to a control group (Jegadeesh, 2000; Denis and Sarin, 2001). As this evidence is concentrated at a few dates, it is unlikely to be as benchmark sensitive, and it is also unlikely that these firms are bearing unusually low risk. There is also evidence that analysts' forecasts are systematically wrong for new issue firms (Teoh and Wong, 2001). In a related vein, positive post-split abnormal performance is also unlikely to be a result of return benchmark error, because earnings forecasts near the time of the split are too low (in contrast with the usual

optimism of analyst forecasts) and on average correct upward in the months after the split (Ikenberry and Ramnath, 2000).

Unusual post-conditioning-event mean returns concentrated at subsequent earnings announcements are a common finding with respect to momentum, value/growth effects, new issues, and post-earnings announcement drift. These findings provide strong evidence against market efficiency. The rational risk premium explanation is that a lot of uncertainty is resolved at subsequent earnings announcement dates, so that the risk premium is very high on such dates. However, it is not clear that systematic risk is high on such dates. Why should covariance with the market suddenly become very high or very low on particular days? Suppose, for example, that the firm is like a capacitor. News about the firm all stays concealed until it jumps out in a single gulp once every 3 months. Then to the extent that the market has moved over the preceding 3 months, a rational market has already inferred the systematic component of the firm's return. The only resolution on the earnings announcement date should be about: (1) idiosyncratic info arriving over the last 3 months, and (2) systematic information over the last one day. So the rational story seems to require strong pricing of idiosyncratic risk, but even if this were the case the findings of negative mean returns at earnings announcement dates for some conditioning variables remains unexplained.

### 3.1.6. Mutual fund performance

*Investors entrust large amounts of resources to mutual funds that, net of fees and costs, do poorly*

However, Grinblatt and Titman (1989) find that *some* funds exhibit consistent positive abnormal performance (pre-expense). Grinblatt et al. (1995) find no persistence with a benchmark that controls for the momentum effect. Consistent with this, Carhart (1997) finds no evidence of persistent positive abnormal performance after adjusting for size, book-to-market and momentum effects. But the evidence of Grinblatt et al. (1995) that some mutual fund managers actively buy high momentum stocks suggests that a few managers can consistently beat standard benchmarks (such as the S&P 500). Nevertheless, perhaps the most interesting finding is the absence of mutual funds taking heavy loadings on value or momentum, or earning the consistently high returns relative to typical benchmarks (e.g., the S&P 500) that one could have earned with these strategies Daniel and Titman (1999).

A datum traditionally adduced in support of market efficiency is that the average mutual fund does not make money; net of fees and trading costs, actively managed funds underperform the market (see, e.g., Malkiel, 1995). Rubinstein (2000) says of this evidence, “the behavioralists have nothing in their arsenal to match it; it is a nuclear bomb against their puny rifles”.

In our view, this fact is interesting but not particularly supportive of market efficiency. Under free choice the funds that attract investors will be those that appeal to investors' emotions and beliefs, however biased. For example, if at some point investors are irrationally thrilled about the tech sector, cash will flow to funds heavy in tech portfolios. More rational portfolios that are light on tech will on average earn

high subsequent returns, but at the relevant moment will be unpopular with investors — that's the very source of the mispricing.

The fact that vast amounts of invested wealth are placed in funds that appear to be wasting resources on active management does not support the view that investors are good at choosing funds, nor that funds make good choices on behalf of investors.<sup>25</sup> There is some dissonance between the views that investors trade foolishly to create potential inefficiencies, and that they are smart enough to invest in mutual funds designed to exploit these inefficiencies.<sup>26</sup>

### 3.1.7. Analyst forecasts and recommendations

Given analysts' bias observed in Section 2.2, we examine evidence about effects of analysts' errors on security prices.

*Analyst forecast revisions and recommendations are associated with subsequent abnormal returns. Unfavorable recommendations have stronger forecasting power than favorable ones*

After analysts recommend or revises forecast favorably about a stock, there are positive abnormal returns (see e.g., Chan et al., 1996; Lin, 2000a, b; Barber et al., 2001; Stickel, 1995; Womack, 1996; Michaely and Womack, 1999; Krische and Lee, 2000). There is strong underperformance after analysts downgrade or sell recommendations but only weak superior performance after new buy recommendations (Womack, 1996). This suggests that investors do not adequately discount for the incentives of analysts to be favorably biased, perhaps in order to keep in the good graces of the firms they follow.

The predictability of returns suggests either that analysts have inside information, or that mispricing is identifiable to expert observers such as analysts. Krische and Lee (2000) report that the predictive power of analysts' stock recommendations is independent of other known predictors of future returns, and indeed that analyst make poor use of other observable predictive variables such as book/market and momentum. Stock market prices do not seem to discount fully for the analyst forecast bias resulting from the tendency of analysts to update their forecasts insufficiently (Lin, 2000a, b). Somewhat different evidence is provided by Easterwood and Nutt (1999), who find that analysts underreact to adverse information about earnings, but overreact to positive information.

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<sup>25</sup> Rubinstein (2000) argues that overconfidence causes managers and investors to work too hard to eliminate profit opportunities, making the market in a sense too efficient. It is plausible that overconfidence will cause individuals to generate more information. But this does not address the possibility that overconfident investors and portfolio managers may take actions that *generate* rather than correct mispricing, as implied by several models (see e.g., Odean, 1998b; Daniel et al., 1998, 2001).

<sup>26</sup> It is true that investors' observation of historical performance should push them toward better funds. This is just an instance of the general argument that when there is a profit opportunity, smart investors ought to exploit it. The general obstacle is that investors may be biased in their assessments. Such bias, in the context of mutual funds, can be hard to eliminate because of inattention, noise, sample size, post-selection/reporting biases, and fund manager turnover.

*Firms in which long-horizon analyst forecasts of earnings are relatively high earn low subsequent stock returns*

For longer horizons, analysts' annual earnings and growth forecasts are too extreme, so that higher forecasts are associated with lower long-run future returns (LaPorta, 1996; Rajan and Servaes, 1997; DeChow and Sloan, 1997; DeChow et al., 2000). Forecast errors explain more than half of the returns to contrarian investment strategies and a significant portion of the abnormal returns after new issues. The predictability of returns from forecast errors is possible if investors rely too heavily on the forecasts, or investors and analysts are subject to similar cognitive biases, or both rely too heavily on some other information.

Overall, the contrast between the evidence of long-horizon overreaction and apparent short-horizon underreaction in analyst forecasts is reminiscent of the evidence of long- and short-lag autocorrelations in stock returns. This suggests that the explanation may involve psychological effects that accommodate both under- and over-reactions, such as the models of Daniel et al. (1998), Barberis et al. (1998) or Hong and Stein (1999).

*3.1.8. Reactions to shifts in fundamental value measures*

*Cash or earnings surprises are followed by positive abnormal returns in the short run. There is a debate as to whether earnings surprises are followed by negative abnormal returns in the long run*

Daniel et al. (1998) provide a model in which overconfidence and bias in self-attribution causes the short-lag post-earnings announcement drift. They also find that these psychological effects are inconclusive about, but potentially consistent with, long-run reversals subsequent to earnings trends. Barberis et al. (1998) argue that conservatism causes short-term underreaction to earnings, but that representativeness causes overreaction to long-term earnings trends.

Several studies find post-earnings announcement drift, i.e., that at short lags earnings surprises are positively correlated with future returns (e.g., Ball and Brown, 1968; Jones and Litzenberger, 1970; Foster et al., 1984; Bernard and Thomas, 1989, 1990), especially for firms with low institutional shareholdings (a possible proxy for investor sophistication; Bartov et al., 2000b).

A substantial portion of the drift is attributable to subsequent earnings announcement dates (e.g., Bernard and Thomas, 1989, 1990; Freeman and Tse, 1989; Rendleman et al., 1987). These studies provide evidence suggesting that the market perceives quarterly earnings to follow a seasonal random walk, when in fact the true process is more complex (see Brown and Rozeff, 1979).

Ball and Bartov (1996) find that prices partially reflect the time series properties of quarterly earnings, whereas Soffer and Lys (1999), using a different method, conclude that investors have a very naive perception of the time series process of earnings. In an experimental study, Maines and Hand (1996) find that investors do not fully reflect the time series properties of quarterly earnings. Burgstahler et al. (1999) find that prices do not fully reflect the transitory effect of special items on earnings.

There is also evidence suggesting that the market's failures in reflecting the time series of earnings is paralleled by failures of analysts to do so (see, e.g., Abarbanell and Bernard, 1992; Lys and Sohn, 1990; Shane and Brous, 2001). Analysts' underreaction to quarterly earnings announcements is one explanation suggested for the post-earning-announcement drift (Abarbanell, 1991, Abarbanell and Bernard, 1992; Shane and Brous, 2001). It is thus plausible to conclude that investors naively rely on analyst forecasts. However, the possibility must be considered that analysts and investors commonly but independently make similar errors. Indeed, Liu (1999) finds that analysts' underreact more than the market, taking as much as two quarters to catch-up with the market.

Rational risk premia do not seem appealing as an explanation for the drift. Bernard and Thomas (1990) estimated that a very large risk premium would be needed to explain post-earnings drift. The concentration of abnormal returns around earnings announcements is hard to explain by reasonable levels of risk, particularly underperformance after adverse surprises. Furthermore, the pattern of abnormal returns after earnings involves positive abnormal returns in the first three quarters subsequent to a positive surprise, followed by a negative abnormal return in the fourth quarter. This is consistent with investors naively perceiving earnings as following a seasonal random walk, so that each quarter they are surprised if earnings deviates from the earnings 1 year earlier. It is not obvious why risk premia would follow such a seasonal pattern. Furthermore, there is evidence suggesting that the drift has diminished since the time that it became publicized in academic research (Johnson and Schwartz, 2000). This suggests that market participants began to perceive and arbitrage a mispricing.

At long lags, there is evidence that trends of earnings and sales growth are negatively correlated with subsequent returns (DeBondt and Thaler, 1987; Lakonishok et al., 1994; Lee and Swaminathan, 2000a, but see also DeChow and Sloan, 1997). However, Chan et al. (1996) do not detect a significant negative relation, perhaps owing to a lack of power in detecting long-run return effects. Lee and Swaminathan (2000a) find that stock return momentum and reversal is associated with the short-lag positive and long-lag negative correlation of earning changes with future returns.

In contrast, Daniel and Titman (2000) decompose 5-year past returns into the component explained by growth in fundamentals such as book value, sales, cash-flow and earnings growth (the response to tangible information), and the residual component that is not (the response to intangible information or to noise). While they find that the long-horizon overreaction to the intangible component is strong, they find no evidence of overreaction to tangible (fundamental) information. In other words, stock price movements which can be linked to changes in accounting variables do not reverse, while price movements that cannot be linked to accounting variable changes experience strong reversals. Daniel and Titman interpret this evidence as consistent with overconfidence, based upon psychological studies showing that investors exhibit more overconfidence about vague or intangible information.

These findings contrast with the findings of overreaction of Lakonishok, Shleifer, and Vishny (1994) (LSV) and Lee and Swaminathan (2000a). LSV and Lee and

Swaminathan both examine *total* growth measures, as opposed to the share-normalized measures used by Daniel and Titman. The measures differ only when the firm takes some action which changes share ownership (e.g., a new issue, repurchase, or the equivalent, but not a stock split).

Daniel and Titman, following DeChow and Sloan (1997), show that the LSV measure does not control for changes in scale. Like DeChow and Sloan (1997), they show that there is no overreaction to a measure that is adjusted for change in scale. DT further show that the LSV measure can be broken down into a component which is due to increased fundamental profitability, and a component which is due to share issuance. DT find that, after controlling for share-issuance, there is no overreaction to the LSV growth measure. In other words, firms which experience high fundamental growth without share issuance do not have low subsequent mean returns. In contrast, firms which have high fundamental growth financed through equity issues do experience low future returns, presumably because overvalued firms tend to undertake new issues.

Avery and Chevalier (1999) find that prices in football markets are influenced by investors' mistaken belief in 'hot hands' — a kind of extrapolation. They test for three sources of mispricing: (1) overweighting meaningless 'expert opinions'; (2) mistaken belief in 'hot hands'; and (3) bias toward prestigious teams (well-known and visible in media). Poteshman (2001) provides evidence that prices are influenced by investors overextrapolating sequences of news related to volatility in options markets.

### 3.1.9. Short sales

#### *Short sellers make abnormal profits through value strategies*

Short sellers may be informed traders. They may be rational arbitrageurs betting on the correction of mispricing. They may also be irrational traders betting against what they wrongly perceive to be mispricing. Some recent papers report that short sellers profit, and that they use value strategies, which suggests bets against mispricing (Asquith and Meulbroek, 1996; DeChow et al., 2001).

### 3.1.10. Feelings and securities prices

There is evidence that determinants of mood affect stock market prices. Kamstra et al. (2000a) find that changes to and from daylight savings time, which disrupts sleep, affects stock returns.<sup>27</sup> Cloud cover in New York is associated with low daily US stock market returns Saunders (1993). A similar pattern applies at a later time period in New York, and across 26 national exchanges and stock indexes (Hirshleifer and Shumway, 2001). Furthermore, stock returns can also be predicted using the pre-opening morning weather. The U.S. effect has persisted in the years subsequent to the Saunders study.

<sup>27</sup>Kamstra et al. (2000b) examine the relation of deterministic seasonal shifts in length of day to seasonality in national stock returns.

### 3.2. The ability of markets to disentangle relevant and irrelevant signals

The findings described in this subsection are generally consistent with limited attention and memory capacity. They also illustrate that cognitive errors by individuals need not cancel out at the level of market equilibrium, because people are prone to similar errors.

The form of investor error in each of these cases is specific, but such examples are extremely revealing. The fact that blatant investor misperceptions demonstrably occur and cause price overreaction suggests that less blatant errors frequently occur, but are simply harder to document beyond a reasonable doubt.

#### *Salient news carries greater weight in market prices*

There is evidence that the publication of irrelevant, redundant or old news affects security prices.<sup>28</sup> This suggests that limited attention and salience effects do affect prices. Curiously, Fama (1991) refers to a ‘morbid fear of recession’, a stray phrase which is appealing in its (perhaps unintentional) hint at investor irrationality. Salience bias suggests that investors will focus excessively on salient risks. The media likes to report on what is new, and to paint what is new as important. The intense attention the media devotes upon transitory phenomena such as recessions and actions by the Fed can induce investors (and economists) to pay too much attention to them.

Both experimental and capital markets literature in accounting considers the hypothesis that market prices are influenced by the form by which information is presented. In some contexts it appears that the form of presentation is important, especially when institutional shareholdings are low.<sup>29</sup> For example, performance information is valued more when it is explicitly recognized (despite the redundancy of the disclosure given information available in financial statements or footnotes), when it appears as a line item on the income statement rather than on other financial statements (e.g., statement of changes in shareholders’ equity), classified as an ongoing operating expense rather than as a one-time charge, and recognized on the face of the financial statement versus disclosed within a footnote. Perceptions also depend on how items are grouped because of the resulting effect on salient financial ratios (e.g., the classification of securities as debt or equity on the balance sheet; and

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<sup>28</sup> Klibanoff et al. (1999) find that reinforcement of changes in net asset value by reporting of the source of the change in a salient outlet, the *New York Times*, causes larger movements in the share prices of closed end country funds. Several cases have been documented of huge stock price fluctuations because of confusion by investors over the ticker symbol (see Cooper et al., 2001; Rashes, 2001). Firms that have changed their names to include ‘dot.com’ have experienced enormous returns, regardless of whether the announcement is associated with reorientation of the business to the web (Cooper et al., 2001). Avery and Chevalier (1999) find that in football betting markets prices are influenced by team prestige (fame and media visibility), and by meaningless ‘expert opinions’. Stock prices react to the republication of news that is already publicly available to the market. For example, Huberman and Regev (2001) report on a stock’s huge price response to a news report that had already appeared widely in the public press 5 months earlier. Ho and Michaely (1988) provides a larger sample of evidence of stock price responses to information that is already publicly available.

<sup>29</sup> See, e.g., Ashton (1976), Hopkins (1996), Dietrich et al. (2000), Maines and McDaniel (2000) and the review of Libby et al. (2001).

the classification of expenses as cost of goods sold or as other expenses in the income statement). The debt/equity classification of securities affects leverage ratios and potentially perceptions of firm risk; the classification of expenses affects gross margin and potentially perceptions of profitability. Amir (1993) finds that each dollar of current cash payments disclosed for postretirement benefit in footnotes was valued as only a dollar obligation in the period 1984–1986, but was valued as \$13.75 (reflecting more fully the implied continuing stream of future obligations) in 1987–1990. The undervaluation of these liabilities in the earlier period indicated limited investor attention to footnote items.<sup>30</sup>

*Market prices imperfectly adjust for differences in accounting method in the evaluation of accounting information*

A key issue is whether market prices makes mechanical use of reported earnings in forming valuations without adjusting appropriately for the accounting method. Such behavior is referred to as ‘functional fixation’.

There is evidence that investors make some adjustment for accounting method in their evaluations of reported earnings. For example, for apparently equal risk firms, price/earnings ratios are on average higher for firms that use accelerated depreciation than those that use straight-line depreciation. The difference in price/earnings ratios essentially disappears when researchers notionally restate earnings to match the methods (Beaver and Dukes, 1973). The market values R&D expenditures as generating an asset even though they are reported as an expense (see Dukes, 1976; Lev and Sougiannis, 1996; Aboody and Lev, 1998). Stock prices react more strongly to earnings that are attested to by a major auditor than by a less-well-known auditor (Teoh and Wong, 1993).

However, there is also evidence suggesting that adjustment for reporting differences is imperfect; in the context of adjustment for tax law changes, see Chen and Schoderbek (2000). There is some debate as to whether the market adjusts for differences in accounting earnings as a result of differences in inventory method (LIFO/FIFO). Some evidence suggests that the market values the tax savings associated with LIFO, and that the market adjusts for the effect of LIFO and FIFO choices on reported earnings, but only imperfectly (e.g., Biddle and Ricks, 1988; Hand, 1995).

It is commonly asserted in the business press that managers prefer mergers involving the pooling-of-interests rather than purchase accounting method because pooling allows firms to report higher earnings. Ayers et al. (1999); Lys and Vincent (1995), Nathan (1988) and Robinson and Shane (1990) provide evidence that bidders pay substantially higher purchase premia in order to use the pooling-of-interests method. Jennings et al. (1996) and Vincent (1997) provide evidence consistent with the stock market valuing pooling-of-interest firms more highly for a given level of earnings (notionally restated to be accounted for identically). Hopkins et al. (2000) find that analysts’ stock-price valuations are lower when the purchase method of accounting is used. Andrade (1999) provides evidence of a significant but small

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<sup>30</sup>In the later period, there were high-profile deliberations that ended in a new ruling requiring recognition of postretirement benefits in 1990.



relation between announcement date merger returns and the effect of the choice of merger accounting on earnings.

Hand (1990) examines debt-equity swaps between 1981 and 1984, which at that time increased reported earnings on average about 20% in the quarter in which the swap was undertaken. In an efficient market which understands the accounting consequences of swaps, the stock price should not react to the mechanically higher earnings at the subsequent quarterly earnings announcement date. He finds that the market is surprised by the higher earnings, and that this effect is stronger when the firm's investor base contains fewer institutional investors (on controlling for the size effect, see also Ball and Kothari, 1991; Hand, 1991).

### 3.3. *Equity premium, riskfree rate and predictability puzzles*

#### *The expected return on equity is high relative to consumption variability*

Some of the various explanations that have been offered for high average equity returns are based upon non-traditional preferences that can potentially be interpreted as reflecting imperfect rationality; see, e.g., Sundaresan (1989), Constantinides (1990), Epstein and Zin (1989, 1991), Hansen et al. (1999) and Barberis et al. (2001); there are also explanations based upon biased beliefs (e.g., Cecchetti et al., 2000; Abel, 2001). The equity premium puzzle (Mehra and Prescott, 1985) is that U.S. equity market returns are so high relative to risk (covariation with consumption growth) as to imply very high levels of risk aversion. These levels of risk aversion imply a very low elasticity of intertemporal substitution in consumption. This in turn implies (unless people have extreme preference for deferring consumption) counterfactually high real interest rates to induce individuals to accept lower consumption now than in the future (consistent with historical growth in consumption). This reasoning yields a combined equity premium/riskfree-rate puzzle (Weil, 1989). However, it is possible that the U.S. was just consistently lucky (Fama and French, 2000), and there may be selection bias in the focus of academic attention based on strong past U.S. performance (Brown et al., 1995).

Another important facet of the equity premium puzzle is the 'predictability puzzle': expected returns in business cycle troughs are historically much higher than at the peak of expansions. However, there is almost no corresponding variability in dividend growth rates or interest rates. Also, while market return volatility is perhaps a little higher in recessions, the relative movements in volatility appear to be small relative to movements in the equity premium, resulting in strong variability in the market Sharpe ratio across the business cycle (Campbell and Cochrane (1999) provide an excellent summary of this evidence and relevant citations).

There are now several proposed explanations for these empirical phenomena. Campbell and Cochrane (1999) propose a model in which a representative investor has a slow-moving habit level. In recessions, the representative agent's consumption is close to his habit level, and consequently he behaves in an extremely risk-averse manner. At the peak of expansions, and consumption is far from the habit level, the representative agent is considerably less risk averse. Moreover, Campbell and

Cochrane show that a particular specification of the habit level can result in a constant riskfree rate.

While these preferences seem to explain the facts, the plausibility of such preferences is still an issue. The coefficient of relative risk aversion of the representative agent varies from 60 at business cycle peaks to a level in the hundreds at business cycle troughs. An alternative explanation of these data is provided by Barberis et al. (2001). BHS suggest that loss aversion combined with a house money effect (a tendency for investors to be more willing to take risks after past successes) can explain both the high equity premium and the variability of the premium. Another alternative is that investors have been overly pessimistic about equity risk or expected payoffs at business cycle troughs and too optimistic at peaks.

A large literature has examined whether stock returns are excessively volatile relative to dividends variability (see, e.g., Campbell and Shiller, 1988). This is essentially the same issue as the question of whether there is excessive long-run reversal, since any overreaction and reversal is bound to increase volatility. In a consumption/investment model, shifts in expected consumption growth should be partially offset by shifts in discount rates. This equilibrium effect tends to mute stock return volatility. Thus, the high volatility of stock prices presents a puzzle for rational asset pricing. Whether it is concluded from the empirical literature that volatility is excessive depends on what is regarded as a plausible amount of time-variation in risk premia. In an interesting comparison, Pontiff (1997) found that the volatility of closed end fund shares was substantially higher than that of the underlying assets held by the fund. Camerer and Weigelt (1991) find that prices overreact to uninformative trades in experimental asset markets, creating informational mirages.

### 3.4. Efficiency of market information aggregation

*It is statistically hard to explain much of the variation in stock market or orange juice futures returns in terms of public news events*

Only a small fraction of stock price or orange juice futures price variability has been explained by the arrival of relevant public news (Roll, 1984, 1988; Cutler et al., 1989; Fair, 2000). Roll (1984) found that the volatility of orange juice futures prices was hard to explain by news about the weather. Roll (1988) found similarly that it was hard to explain much of the variability of individual stock returns using public news events. Fair (2000) examines the largest 5 min movements in the S&P 500 futures contract from 1982 to 1999, and find that many of them have no obvious associated public news arrival. Easton et al. (1992) found that even with a time horizon as long as 10 years accounting measures can explain only about 60% of the variability of stock returns.

Franklin Allen, in his presidential address to the American Finance Association, emphasizes the magnitude and economic importance of asset bubbles. He cites the example of the 'lost decade' in Japan.<sup>31</sup> The bursting of the Tokyo real estate bubble

<sup>31</sup>The Tokyo Palace grounds at end of 1989, a few hundred acres worth the same as the whole of Canada, or the whole of California (Ziemba and Schwartz, 1992).

has seen high priced real estate fall to about a quarter of its peak so far, with devastating effect on Japanese banks and the financial system, and the U.S. Internet stock bubble.<sup>32</sup>

Anecdotally, there have often been allegations that prices are poorly associated with fundamental news in historical episodes of stock market boom and bust, and in famous speculations such as the Dutch Tulip Bulb boom (which Garber (1989) suggests may have been mainly rational). For example, it is not obvious what fundamental news explains the October 28, 1929 or October 19, 1987 stock market crashes and other large stock price movements (see, e.g., Cutler et al. 1991; Shiller, 2000a, Chapter 4). Consistent with overreaction, Seyhun (1990) found that insiders purchased heavily after the crash, especially the stocks that fell the most. Shiller (2000b) describes a number of other ‘new eras’ and bubbles around the world.

Early classic experimental work on securities market efficiency found that experimental markets were surprisingly effective at aggregating the information of participants. However, as discussed by Bloomfield (1996), in a complicated environment, the problem of inferring why others made the trades they did can be very difficult. In the late 1980s and 1990s a body of experimental market research (see, e.g., Plott and Sunder, 1988; O’Brien and Srivastava, 1991) considered somewhat more complicated information environments. In these settings, information was generally not aggregated efficiently (as discussed in the surveys of Sunder (1995) and Libby et al. (2001)).

Market prices in laboratory markets are affected by the form of presentation of information. This supports the notion that the market equilibrium reflects a balance between the value of good information processing and cognitive resource costs (see, e.g., Dietrich et al., 2000).

### *3.5. The effect of investor biases on risk sharing, consumption and investment*

The evidence that we have described suggests that investor biases affect security prices substantially. An important issue is whether this in turn causes real resource misallocation. The evidence in Section 2.1 indicates that there is suboptimal risk sharing across individuals. Investors hold poorly diversified portfolios, allocate their across pension plan funds in an ad hoc fashion, and their overconfidence apparently leads them to bear risk and expend excessive trading costs. Such allocation errors are presumably reflected in lower average individual consumption growth and higher consumption variance.

Some rough estimates of the excessive transaction costs incurred can be made. For example, the average actively managed mutual fund charges a fee of 130 basis points per year Carhart (1997), compared to 20 basis points per year for the Vanguard 500

<sup>32</sup> Allen describes how at the end of March 2000, the CBOE Internet index peaked at over seven times the level at end of 1998, but by end of 2000 was down to 1 1/2 times that level. Ofek and Richardson (2001) review several sources of evidence which, in their view, confirm that the boom and bust of U.S. internet stocks was a result of market misvaluation and how limits on short-selling made it hard for smart investors to arbitrage away mispricing.

Index fund. Since the total value of actively managed mutual funds is over \$1 trillion, this suggests annual fees exceeding \$10 billion per year. The costs incurred are not mere transfers; they compensate workers in the investments sector who could presumably be undertaking productive activity.

However, these costs would be present whether or not investor errors result in inefficient prices. The recent bubble in U.S. internet shares suggests that market inefficiency causes real misallocation of resources. More generally, a manager who cares about the firm's stock price may have an incentive to undertake equity repurchases when the stock is underpriced, and sell stock when it is overpriced. There is indeed evidence (discussed in Section 4.1) that managers act opportunistically when shares are overvalued or undervalued by engaging in new issues, repurchases, or M&A. However, rather than investing wastefully when the firm is misvalued, managers can potentially invest the proceeds from equity issues in repurchase of debt or in other securities, and the firm can potentially raise funds for good investment opportunities (and for any equity repurchases) through debt issues when the stock is overpriced.

Evidence that auction bidders have been subject to a winner's curse is consistent with overconfidence. In the takeovers context, this has been referred to as 'hubris' (Roll, 1977). Such evidence provides a further suggestion that imperfect rationality affects resource allocation.

Chirinko and Schaller (2001) provide a careful examination of whether the 1980s stock market boom in Japan was associated with higher fixed investment. They document that equity issuance rose a great deal through 1989, consistent with firms believing their equity was overvalued. Their test based upon an optimal investment model indicates that there was substantial stock market mispricing (which they call a bubble). They also find, using both a non-structural equation for forecasting investment that controls for macroeconomic factors, and a structured test based upon first-order conditions for investment, that investment was unusually high in the late 1980s. Their point estimates suggest that misvaluation increased business fixed investment by at least 6–9% during 1987–89, or about 1–2% of GDP.

There is some ancillary evidence which suggests a strong link between market efficiency and economic performance. Wurgler (2000) presents evidence that capital allocations are better in countries that have more firm-specific information in domestic stock market prices. If less-informative stock prices are also more subject to psychological bias, then this finding suggests that there is a link between market efficiency and resource misallocation.

As discussed in Section 3.3, a potential explanation for the wide business cycle variation in expected returns is that investors are overly pessimistic about equity risk or expected cash flow at the time of business cycle troughs, and overly optimistic at peaks. This interpretation suggests a disturbing possibility. Cochrane (1991) shows that movements in production across the business cycle are consistent with the variability in returns that we see. This suggests that firms respond to movements in equity prices by varying their investment and production levels. This is reasonable, unless firms are responding to irrational shifts in market expected returns. If so, psychological biases may be causing large resource misallocations.

#### 4. Do firms exploit investor biases?

We consider evidence as to whether firms take actions to exploit the investors' biases. If this occurs, then the case for policy to protect investors is strengthened. This includes evidence of actions taken to *create* mispricing and *in response* to mispricing.<sup>33</sup>

##### 4.1. Possible responses to mispricing

###### *Firms seem to trade to exploit market misvaluation of their shares*

There is evidence consistent with the hypothesis that firms repurchase or issue shares to profit from market misvaluation (see, e.g., Jindra, 2000; D'Mello and Shroff, 2000; Dittmar, 2000). Baker and Wurgler (2001) suggest that existing capital structure primarily reflects the consequences of past efforts of firms to time the equity market. More generally, important aspects of corporate payout and financing patterns seem potentially related to mispricing. Closed-end funds are started in those years when seasoned funds trade at premia or modest discounts relative to net asset value (Lee et al., 1991). New funds tend to be issued at a premium (and investors pay a substantial commission), but tend to be traded at a discount in the aftermarket (Peavy, 1990), suggesting that early buyers are too optimistic. Firms tend to issue equity (instead of rebalancing their capital structure) after rises in value,<sup>34</sup> as well as when the firm or its industry's book/market ratio is low. The amount of financing and repurchase, and equity-financed merger bids varies widely over time in an industry-specific way.

##### 4.2. Do firms try to mislead investors?

###### *Firms manipulate market perceptions to create market misvaluation*

Earnings reported on firms' financial statements are generated by adjusting cash flows, in principle to reflect the firm's future cash flow prospects. There is evidence that firms choose income-increasing accounting methods (e.g., purchase versus pooling in acquisitions — see the discussion of Section 3.2), or report high accounting adjustments (accruals) to improve investor perceptions artificially. As discussed in Section 3.1.3, subsequent to abnormally high accruals, firms on average experience abnormally poor stock return performance (Sloan, 1996; Teoh et al., 1998a, b; Chan et al., 2000b; Xie, 2001). Part of this effect seems to come from accruals taken after changes in inventories (Thomas and Zhang, 2001).

Pincus and Wasley (1994) find that voluntary accounting changes tend to be made by firms that have been experiencing poor prior accounting performance, and that

<sup>33</sup>Trading activity by insiders in response to mispricing is covered in Section 3.1.5 on event-related predictability. Outsiders may also take actions in response to mispricing. Trading by mutual funds to make abnormal profits based on public information Grinblatt and Titman (1993) is covered in Section 3.1. We also do not consider actions taken by investors to create mispricing (manipulation).

<sup>34</sup>Korajczyk et al. (1991) provide a rational explanation for this phenomenon.

the changes tend to increase earnings. Hand et al. (1990) find that firms undertake a transaction, insubstance defeasance, in part to ‘window dress’ their earnings. The exception is changes to LIFO, which enable the firm to reduce its taxes by reducing earnings. Furthermore, firms that choose to adopt newly mandated changes earlier in the adoption period are those for which the changes are more income increasing (Amir and Ziv, 1997).

*Upward manipulation of earnings is stronger at the time of new issues of equity and prior to heavy insider trading*

The incentive to favorably influence investor perceptions should be particularly strong when the firm is selling equity. Accruals, and especially discretionary accruals, are abnormally high at the time of new IPO and seasoned equity issues (see Teoh et al., 1998c; Teoh et al., 1998a, b; Rangan, 1998).<sup>35</sup> Earnings management is related to insider trading (Richardson et al., 2000). Greater earnings management is associated with more optimistic errors in analyst earnings forecasts both in new issue firms and in the general sample (Teoh and Wong, 2001), suggesting that analysts are credulous about reported earnings. Furthermore, auditors in their audit opinions do not seem to take into account the level of unusual accruals (Bradshaw et al., 1999).

Greater earnings management at the time of new issue is also associated with more adverse subsequent long-run abnormal stock returns (Teoh et al., 1998a, b; see also Rangan, 1998). This suggests that investors, possibly under the influence of analysts, do not adequately discount for earnings manipulation.<sup>36</sup>

*Managers adjust earnings to meet threshold levels such as zero, past levels, and levels forecast by analysts*

This was established persuasively by Burgstahler and Dichev (1997) and DeGeorge et al. (1999). Possibly under the influence of management, stock analysts on average ‘walk down’ their forecasts from overly optimistic levels to pessimistic forecasts that firms are likely to beat by year-end (Richardson et al., 2000). Consistent with this, Bartov et al. (2000a) report that the stock return associated with an earnings surprise relative to forecast does not depend on how the forecast got there, i.e., the return depends only on the final month forecast.

The accruals/return relation does not seem to depend on the extent of analyst following or of institutional ownership (Ali et al., 2000). There is evidence that some firms

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<sup>35</sup> Collins and Hribar (2001) find in a different time period that this conclusion for discretionary accruals is sensitive to the method for measuring discretionary accruals. However, their benchmark for comparison is a sample matched by earnings. If the issue firms have boosted earnings, then matching firms by earnings will tend to select for high-earnings benchmark firms, so that the benchmark tends to be contaminated by firms that have also managed earnings upward (Loughran and Ritter (2000) make some related points about benchmark contamination in return studies). The possibility of contamination raises a question of the power of this test technique for identifying abnormal accruals.

<sup>36</sup> It has been suggested that survivorship issues may create inference problems for studies involving long-horizon returns (see, e.g., Kothari et al. (1999) and the discussion of Kothari (2001)), because much of the initial sample of firms have left the sample after several post-event years, and because long-horizon returns are highly right skewed. However, Teoh et al. (1998a) consider monthly cross-sectional regressions, not long-horizon returns, which should minimize the effects of survivorship and skewness.

smooth earnings, presumably to create the impression that the business follows a stable growth trend. Barton (2001) found that hedging by means of financial derivatives (which can genuinely stabilize cash flows) tends to substitute for earnings management by means of accruals. The use of high abnormal accruals to increase earnings is positively associated with subsequent lawsuits against the firm's auditor (Heninger, 2001).

## 5. Investor and analyst credulity: causes and consequences

We argue here that an important regularity emerges from the evidence on investor, firm, analyst and market behavior. This is that investors and analysts are on average too credulous in the following sense. When examining an informative event or value indicator, they do not discount adequately for the incentives of others to manipulate this signal. However, to the extent that analysts' self-interest are aligned with the firms they cover, analysts may have incentives to forecast *as if* they were too credulous about the firm's accounting reports. Although some individuals or professionals may be hard-edged cynics, it seems to be hard for most people to maintain rational skepticism consistently in many contexts. We will also suggest possible psychological sources of the regularity and implications for market equilibrium.

The evidence of Sections 2–4 indicate that investors and professional analysts are too credulous about firms' accounting choices that increase their earnings; that investors do not draw a sufficiently skeptical (pessimistic) inference when firms undertake new issues, causing them to buy overpriced shares; that investors do not draw a sufficiently skeptical (optimistic) inference in response to repurchase, causing them to sell their shares to the firm too cheaply; that firms engage in new issue and repurchase in ways consistent with exploiting credulity (buy low, sell dear); and that individuals are often victimized by fraud or market manipulation that a reasonably skeptical person would be able to avoid (such as losses associated with believing anonymous internet chat).

Consumers seem to be insufficiently skeptical about firms' motives for refraining from disclosing information. For example, Mathios (2000) examined the effect of the Nutrition Labeling and Education Act on purchases of salad dressing, which made mandatory the labelling of information about fat content. He found that even though there was voluntary labelling (mostly of low-fat brands) prior to the regulation, mandatory disclosure caused the fattiest dressings to lose market share. Hanson and Kysar (1999) review a literature in consumer psychology and marketing on the ability of sellers to manipulate consumer perceptions of their products.

Investors also seem to be insufficiently skeptical of firms that refrain from disclosing information, or that disclose in a non-salient fashion. For example, there is evidence that firms tend to release good news early and bad news late,<sup>37</sup> the exception being that the possibility of litigation can induce disclosure of bad news (Skinner, 1994). Such behavior is consistent with a fully rational equilibrium with

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<sup>37</sup>See Chambers and Penman (1984), McNichols (1989), Begley and Fischer (1998), and Haw et al. (2000).

proprietary disclosure costs (e.g., Verrecchia, 1990; Darrough and Stoughton, 1990; Feltham and Xie, 1992). However, this raises the question of whether such costs are high enough to explain this bias. Excessive investor credulity strengthens the incentive of firms to behave in such a fashion, as well as explaining why firms prefer reporting adverse information in non-salient ways.

The evidence of strong underperformance after analysts downgrade or sell recommendations but only weak superior performance after new buy recommendations (Womack, 1996) suggests that investors do not adequately discount for the incentives of analysts to be favorably biased. (For example, analysts may need to keep in the good graces of the firms they follow.)

The varied market evidence supporting credulity carries more impact if there is a good psychological explanation for the phenomenon. We suggest two: limited attention/processing power, and overconfidence. Psychologists have studied how limits to attention lead to an excessive focus on salient stimuli at the expense of less salient stimuli (cue competition); and how easy availability of a stimulus causes it to be weighed more heavily (see, e.g., Tversky and Kahneman, 1973; Kruschke and Johansen, 1999). This suggests that an individual will neglect some signals — it is as if he just does not have them, and will properly weight some other signals. On average the signals are underweighted. In a market setting, an individual who observes a signal and understands that others are underweighting it will profit by trading more aggressively. However, there remains a smaller pool of riskbearers possessing this signal, so on average the market price reaction to the signal is reduced.<sup>38</sup>

A modest extension of this idea is that owing to limited attention, people focus on only a few ideas or theories at a time while neglecting others. If the idea or theory that needs to be recognized is that some party is strategically manipulating information, then there will tend to be too little skepticism on average.

The second source of excess credulity is overconfidence. We expect overconfidence often to contribute to credulity, although in some cases it can act in the opposite direction. If an investor thinks that his expectation of future cash flow is very accurate, he will place little weight on the manager's information. In consequence, if the manager is taking an action such as a new issue or repurchase based on private information in order to exploit investors, the overconfident investor will adjust his valuation insufficiently (related arguments are made by Daniel et al., 1998).

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<sup>38</sup> People with limited attention may overreact to salient news. For example, Klibanoff et al. (1999) find that investors react strongly to salient news about closed end country funds. Even though investors sometimes seem to overreact to salient news, limited attention may still create an overall tendency to underreact. An individual who understands his own lack of attention will ignore some signals, but should not in compensation intentionally overweight (relative to his prior) the signals he does notice.

A complication is that the signal is salient precisely because it is extreme. Then the individual should even discount for the extremity of the signal. He may not do so properly because this requires processing and attention. Even if he does this discounting correctly on average, he is likely to make errors in assessing how strong the selection bias is, because this requires processing information such as how large is the pool of signals from which the extreme value statistic is being drawn. See Tversky and Kahneman (1971) on representativeness and the neglect of sample size. This neglect of sample size or focus on representativeness is consistent with limited attention.



Similarly, an overconfident investor will tend to place insufficient weight on the failure of a manager to disclose (presumably adverse) information.

The example of new equity issues and repurchases illustrates how limited attention and overconfidence may affect firms' incentives to take informative actions. A manager who has an incentive to maintain a high stock price will try to make profits in his firm's share trading. This encourages issuance of new shares when the stock is overvalued (owing either to information asymmetry or to market irrationality) and repurchase when the stock is undervalued. If the market is credulous and fails to discount fully for this incentive, then the manager will indeed get a good price for the shares it buys and sells through this procedure. The market may understand that new issues are an adverse indicator of value, consistent with a negative stock price reaction, but being insufficiently skeptical, the price does not fall enough. This leads to a long-run negative return. Similarly, consistent with the evidence, this story suggests a positive price reaction to repurchase and a long-run positive average abnormal post-event returns.<sup>39</sup>

Managers generally like high stock prices, so stocks that are more subject to investor credulity should on the whole tend to be overvalued. The problem of credulity is likely to be greater for firms that are able to weave hard-to-refute stories to tell investors about future prospects. Thus, empirical findings of inferior performance of stocks with low book/market ratios, and the stronger relation of book/market to returns among high R&D firms (Chan et al., 2001), are consistent with credulity.<sup>40</sup>

The fact that firms lobby against income-reducing accounting changes, adopt accounting changes when they are income-increasing, and advance disclosure of good news and defer bad news makes sense if investors are on average too credulous about information provided by or influenced by interested parties. Suppose that investors have limited attention and processing power. If an investor happens to focus attention on pension liabilities, he may discount for the possibility that they are large skeptically and appropriately. But when he is focused on other considerations, he may implicitly treat the firm as typical rather than discounting skeptically for non-disclosure. This behavior is constrained-optimal (subject to limited attention). On average this will lead to underdiscounting, which most firms like.

In contrast, in simple fully rational settings, if disclosure is costless, all information is disclosed.<sup>41</sup> There are some qualifications to this conclusion based upon proprietary costs, firms that do not receive information, and signalling

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<sup>39</sup> Other psychological effects are also potentially consistent with credulity. For example, Barberis et al. (1998) propose that investors sometimes react too little to public information signals owing to a conservatism bias.

<sup>40</sup> Daniel et al. (2001) provide an overconfidence-based explanation for such effects based upon overreaction to private information signals rather than credulity about managerial incentives. These accounts are reconcilable if management is able to manipulate not just public information sets but also information which investors perceive to be 'private'. For example, investors may trade upon information provided to them by analysts, even though this information is fed to analysts by management.

<sup>41</sup> In the most basic possible setting, there is rationally extreme skepticism of failure to disclose — the 'unravelling' results of Grossman (1981) and Milgrom (1981).

incentives.<sup>42</sup> However, it provides a useful first approximation and benchmark for comparison.

We do not yet have equilibrium models of disclosure policy when investors are imperfectly rational. Nevertheless, we argue that for two reasons limited attention makes investors less skeptical. First, as mentioned above, investors sometimes may simply not notice that a potential disclosure did not occur. Second, if studying disclosures is costly for investors, there is an innocent reason for the firm to withhold a datum — so that it can focus investor attention on more relevant data. When attention is limited, disclosing everything is disclosing nothing; the forest is lost for the trees. Psychological evidence of cue competition suggests that firms can sometimes inform investors better by telling them less. Thus, mandating full disclosure may be excessive even if there are no proprietary reasons to keep secrets.

As a consequence of excessive credulity, it is plausible that a partial disclosure equilibrium analogous to that of the Verrecchia model will obtain. Firms with more favorable information disclose. But firms with sufficiently adverse information (below some cutoff) withhold information and delay revelation.

## **6. Psychology and policy: basic issues**

If capital markets are complete and informationally efficient, no externalities exist, and individuals are rational, then economic theory directly supports a policy of *laissez faire*. Individuals should be left free to engage in mutually beneficial transactions, and government should limit itself to enforcing contracts and property rights. In consequence, some proponents of *laissez faire* rest their case upon the efficiency of capital markets.

However, the evidence in Section 3 indicates that psychological biases have important effects on security prices. In addition, episodes of alleged market euphoria and panic such as the internet bubble of the 1990s are often casually attributed to market psychology. It is also often casually argued that the madness of crowds necessitates government intervention in, and regulation of, markets. Circuit breakers, transactions taxes, and government stabilization of the stock market have been proposed and used as mechanisms to decrease speculation and the risk of financial panics (see Section 8 for further discussion).

Also, we argued in Section 5 that investors are excessively credulous about the strategic motives of managers and other providers of information to the market. If so, then investor perceptions are subject to manipulation by interested parties. This suggests that government regulation of capital market transactions may help protect the unwary.

Nevertheless, the scientific hypothesis that markets are highly efficient is quite distinct from the normative position that markets should be allowed to operate freely. Thus, proponents of *laissez faire* who so strongly emphasize the informational efficiency of capital markets may have drawn an unduly brittle defensive line.

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<sup>42</sup>See, e.g., Verrecchia (1983), Dye (1985), Teoh and Hwang (1991), and Teoh (1997).

We argue here that the existence of important market misvaluation does not justify a hair-trigger readiness for government to interfere with private transactions. Individuals are just as subject to psychological biases and self-interested motives when they participate in the coercive political arena as when they participate in voluntary market transactions. Indeed, the incentives of officials to overcome their biases in evaluating the value of alternative policies are likely to be weak, as contrasted with the incentive of market participants to improve their judgments to make trading gains or avoid losses. Just as there are predators in private markets who exploit the irrationalities of investors, political pressure groups and entrepreneurs exploit the irrationalities of voters in the political realm. Individual investors have strong incentives to learn enough to avoid being exploited. Owing to free-rider problems in political activity, individual voters have very weak incentives to avoid being fooled.<sup>43</sup>

The ability of special interest groups to sway the political process unduly may derive from the ability of motivated parties to manipulate political discourse. Kuran and Sunstein (1999) analyze how biases in public discourse can lead to what they call *availability cascades*, and the perverse effects this can have on regulation of risks arising from pollution or disaster. The very fact that a viewpoint is widely disseminated and salient makes people conclude that it is probably true. Imitative adoption of actions or judgments can be rational (see, e.g., the models of Banerjee (1992) and Bikhchandani et al. (1992)), but such effects are intensified by overapplication of the availability heuristic (Tversky and Kahneman, 1973), by preference for the familiar (what psychologists call ‘mere exposure’ effects), and by the tendency of people to avoid expressing viewpoints contrary to the prevailing one. Kuran and Sunstein give examples of how, and reasons for why, “mass delusions... may produce wasteful or even harmful laws and policies”. In addition to biases in the political process, there is the problem that resources are wasted in political influence activity. Thus, the case for *laissez faire* rests most persuasively not on extreme informational efficiency of private markets, but on the comparative informational and resource inefficiency of the political process. Academics are far from immune to fads, as the discussion of intellectual fashions in the introduction indicates. This further supports the *laissez faire* view — economists also should first, do no harm.

In a fully rational capital market, government intervention can in principle address externality issues, such as the non-correspondence of the private and social gains to generating information (see Hirshleifer, 1971), and to reduce duplication of efforts by individuals in generating information (see e.g., Coffee, 1984; Diamond, 1985). However, as irrationality and self-interest infect the political process, there is

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<sup>43</sup> Voters may remain rationally ignorant of the pros and cons of important political issues as each individual’s vote has low probability of influencing the outcome. However, voter misjudgment seems to go beyond the rational, and is more consistent with severely limited attention and with emotion-based decisionmaking. There is not much point for an individual voter to overcome his instant gut reactions if he cannot individually affect outcomes. However, many individuals care deeply about social outcomes and devote great personal efforts in support of policies that seem peculiar. This may simply be because forming rational judgments about social issues is even harder than forming rational judgments for private decisions.

good reason to place constitutional constraints on the political process in favor of *laissez faire*. Thus, imperfect rationality may on the whole *strengthen* the case for restraint in government regulation of securities markets.

Nevertheless, when markets are imperfectly rational, there is room for *some* regulation. Regulation can help because the cognitive biases and interested motives of individuals participating in the political sphere differ from the biases and motives displayed in market contexts. The political process will surely create inefficiencies, but it may remedy some problems as well. We therefore suggest two limited and related goals for public policy: (1) to help investors avoid errors, and (2) to promote the efficiency of the market. Even if our conclusion that market prices are imperfectly rational be denied, the evidence discussed in Section 2.1 that investors are prone to important and blatant errors is very strong. So public policies to protect investors merit consideration.

Investor protection regulation can potentially help naive segments of the public (such as purchasers of penny stocks) or larger groups of people in decision contexts where they have low decision-effectiveness (e.g., retirement plan contributions — see Benartzi and Thaler, 2001). Although political participants have self-interested incentives, these incentives will often differ from the self-interested incentives of market predators (as in the penny stock example); and there may be political pressure to help individuals to achieve good outcomes (in the retirement plan example).<sup>44</sup>

If there is increasing marginal welfare loss from different kinds of misallocations, it may improve welfare to substitute away from voluntary privately generated misallocations toward coercive, publicly generated misallocations. In some cases a very limited application of government coercive power may go far to remedy some of the more severe problems that freely interacting individuals encounter.

Free market opponents of securities markets regulation have made some valid arguments about the ability of investors to protect themselves through intelligent skepticism, the value to firms of protecting their reputation, and the ability of markets to generate verification institutions such as auditing, bond ratings and so on.<sup>45</sup> However, similar arguments could be applied to oppose having laws against fraud — individuals are free to be skeptical, to rely on reputation, and to rely on institutions. Nevertheless, most free market advocates like having laws against fraud. For similar reasons, regulation of disclosure and financial reporting can be beneficial.

Bainbridge (2001) emphasizes that a political regulatory process is unlikely to arrive at an optimal balance of the marginal costs and benefits of disclosure. Modern information technology has greatly reduced the marginal cost of disclosing non-proprietary information. More importantly, as suggested above, the problems

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<sup>44</sup>Examples of existing and possible regulations to protect investors include the waiting rules that slightly delay investor decisions on penny stocks to reduce the effectiveness of broker pressure tactics, and rules that companies must advise employees as to the riskiness of investing retirement money in company stock. Examples of regulations to improve market efficiency include accounting rules for disclosure and for consistent reporting.

<sup>45</sup>Some defenders of free capital markets include Benston, Easterbrook, Fischel, Manne, and Stigler; see the discussion of Coffee (1984).

created through the political process are likely to differ from those created by the free interaction of individuals and firms. Firms may wish to withhold bad news in order to profit at the expense of investors, so that if investors are unduly credulous, there is too little disclosure. To the extent that the political process does not induce regulators to share this interested motive, regulation can serve the useful purpose of coercing more disclosure. It is true that the political process may lead to a pressure toward too much disclosure. If so, a constitutional bias in favor of *laissez faire* will be useful in constraining this pressure.

The potential benefits of financial reporting rules and mandated disclosure are to protect credulous investors and advance market efficiency. Government may also have a useful role in limiting misleading (even if literally truthful) advertising, and in promoting investor education. Under full rationality, education would consist solely in obtaining new information signals about fundamentals. The government is unlikely to be superior at generating such signals.

In addition to having incentives to gather information signals, individuals have private incentives to overcome their own judgment and decision biases. Ideally the market will spontaneously supply good education to investors.<sup>46</sup> However, both because there are presumably large externalities to investor education and because of investor overconfidence, individual efforts to obtain education and to improve the rationality of decisions are bound to be imperfect.

A big obstacle to overcoming bias is that someone who is irrational in his direct investment decisions is also likely to be irrational in his decision to seek out investment advice, and in his choice of intermediaries. Time and again people obtain guidance from shallow or misleading sources (such as the event-oriented financial press, financial ‘gurus’, and simplistic internet advisory sites). Investors obtain advice from sources with interested motives, such as analysts who own shares in — or whose firms have underwriting affiliation with — the firms they are recommending, brokers who can profit by recommending expensive trades, and bond ratings agencies that are paid by the bond issuer. If investors are highly rational, then in equilibrium information intermediaries will arise to convey information to investors credibly. But if investors are imperfectly rational (and especially if investors are excessively credulous), in equilibrium intermediaries may profit by accommodating or participating in the exploitation of investor biases.<sup>47</sup>

In principle, government can help make investors aware of their psychological biases, so that they can consciously compensate for them; can require appropriate advice and warnings; and can induce disclosure in formats that minimize or counteract known biases. And especially, government can be helpful by avoiding activities, such as long-run inflationary and volatile monetary policy, that make decision biases worse.

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<sup>46</sup>Some signs of progress are that the Chartered Financial Analyst exam now regularly includes questions and topics relating to psychology and finance; and business schools are just beginning to integrate psychological topics into their finance curricula.

<sup>47</sup>Furthermore, investors’ efforts to obtain advice from the mass-media may make the market less efficient by promoting investment fads.

One possible role for government is to intervene directly to correct current market misvaluation.<sup>48</sup> Such policies are considerably more intrusive than setting up reporting or disclosure rules up front. Government speculation in stocks creates winners and losers, and therefore encourages the expenditure of resources by political pressure groups. We strongly suspect that the inefficiencies of the political process will be much greater in such interventions than for rules on disclosure and reporting. We are also somewhat skeptical of the ability of courts to determine value better than past market prices.<sup>49</sup> We would therefore hesitate to recommend giving courts much leeway (as with the ‘bounce back’ provision of the Private Securities Litigation Reform Act of 1995; see Thompson, 1997) to attempt such evaluations for large and liquid capital markets.

More controversial than disclosure and reporting regulations are restrictions on trading behavior designed to prevent sharks from preying on the foolish, or to prevent the foolish from hurting themselves. Fortunately, recent research on psychology and securities markets suggests that some changes that involve minimal invasions of individual liberty may have large effects on choices, as discussed in Section 8.

## 7. Reporting standards and disclosure regulation

Evidence of investor credulity suggests that allowing interested parties to manipulate available information will cause social harm. Although the evidence at the disposal of academics seems important for public policy, academic accountants have often been hesitant to draw policy conclusions from their scientific research. Beresford (1994), a former FASB chairman, lamented that this hesitancy has limited the influence of accounting research on standard setting. On the other hand, Schipper (1994) suggests that the relative advantage of academics is in studying scientific issues, whereas standard setters have a relative advantage in making value judgments and setting policy. However, practitioners, regulators and the public often have in mind a different *descriptive* paradigm from the traditional academic one. Many practitioners think that investors and markets often make poor use of accounting information, and that the form as well as the content of financial disclosure are important. Faith in an extreme version of efficient markets theory, on the other hand, limits what some academics have to say about this topic (see Skinner and Dechow (2000) for related comments).

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<sup>48</sup> Such actions are not uncommon. On 8/14/98 Hong Kong is estimated to have spent approximately \$HK 15 billion on stock and futures market trading to support prices (Lake, 1998) — an intervention which was by some standards successful. In an apparent effort to deflate a market bubble, Alan Greenspan famously remarked upon the ‘irrational exuberance’ of the U.S. stock market.

<sup>49</sup> It is true that under imperfect rationality, the presumption that market prices are the best guide to estimating value in legal damages is weakened. With the benefit of ex post data, a court may be able to assess whether a *past* market price was rational. However, such evaluations are difficult, and are likely to be influenced intensely by hindsight bias (an incorrect belief that the outcome observed ex post would have been obvious to the observer ex ante).

We think that the non-academics and behavioral academics have a point. Academics potentially have an important role to play by offering careful analysis of the economic implications of the psychological biases of accounting users. Such analysis can help firms decide how to disclose voluntarily, and can give regulators more to go on than gut feelings in the face of political pressure.

Psychological principles suggest that in providing information to investors, it is important that relevant information be *salient* and *easily processed*. As every academic author and teacher knows, the form as well as the content of communicated information affects how well it is absorbed. Relatedly, the framing of a problem of judgment and decision can make a big difference.

The evidence discussed in Sections 3.2 and 4.2 confirms that presentation and accounting method choice influences the perceptions of investors (and in some cases analysts). Perceptions are influenced by which accounting statement an information item appears in; by footnote disclosure or financial statement recognition, or by explicit disclosure; by how items are labeled or classified within a statement (e.g., inclusion as part of a salient accounting ratio); by the timing of recognition of changes in performance; and by whether accounting numbers meet key thresholds.

One hypothesis is that firms self-select in their reporting format or accounting choices as a function of other non-disclosed private information, so that investors can infer useful information from the format. There are, however, several indications (discussed in previous sections) that investors do not interpret accounting information in a fully rational way. Accruals and different kinds of balance sheet information can be used to predict future stock returns. In experimental studies, individuals and analysts make incorrect use of accounting information in forming their expectations. Misperceptions extend not just to reporting of cash flow performance, but to disclosures of risk (Lipe, 1998). Practitioners and interest groups passionately debate reporting choices, even when they are apparently equivalent in the information they directly convey (apart from tax costs). Firms typically lobby and argue vehemently in favor of the approach that allows them to report higher earnings, even though investors ought to understand that such higher earnings are purely cosmetic.<sup>50</sup>

In some cases the reporting decision goes beyond cosmetics to have direct real economic consequences, as with the tax effects of the LIFO/FIFO choice. It is

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<sup>50</sup>Firms may have succeeded in these endeavors. Mandated accounting changes have been income-increasing (Pincus and Wasley, 1994). For example, the proposal to recognize stock option compensation as an expense failed owing to stormy protest by firms with high levels of outstanding executive options, especially high-tech companies in the 1990s. A Merrill Lynch study (7/5/2001, *Reuters*) found that Yahoo's 2000 earnings were 1887% higher than they would have been if stock option expense had been included. Out of 37 major high-tech companies, earnings were 60% higher as a result of excluding option expense. Compensation expense can be inferred from information in footnotes and proxy statements, so the strong opposition of firms seems to reflect a belief that investors pay more attention to expenses that are presented saliently. Furthermore, Garvey and Milbourn (2001) find that companies with large executive option grants experience negative subsequent abnormal returns. Similarly, new standards mandating reporting of pension liabilities did not pass in 1981 when pensions were underfunded, but subsequently passed in 1986 when pensions were overfunded. Indeed, there is evidence that firms choose pension asset allocation in a fashion that permits them to avoid recognizing pension liabilities (Amir and Benartzi, 1999).

striking that firms sometimes choose the high-tax/high-earnings option (see, e.g., Biddle, 1980). Such choices could be costly signals in a rational setting (see, e.g., Hughes and Schwartz, 1988). However, these choices may also reflect an effort to fool credulous investors.

Also going beyond mere form are decisions about when and whether to disclose additional substantive information (rather than merely varying the form of presentation). Firms seem to have a strong distaste for required disclosure of liabilities, as with disclosure of pension liabilities and post-retirement employee benefits. Fully rational investor skepticism should force voluntary revelation of such information. Indeed, the fact that a firm or industry organization would campaign for secrecy would itself seem to reveal bad news. However, if investors are excessively credulous, rules forcing more disclosure can be helpful. This reasoning provides a motivation for mandatory disclosure rules.<sup>51</sup>

Firms recently have been trying to promote favorable investor perceptions by disclosing *pro forma* earnings conspicuously (instead of the bottom line number reported to the SEC on Form 10K), taking out what they do not like such as one-time charges.<sup>52</sup> This allows firms to say that they have beaten analysts forecast. There is no standard for these disclosures; firms do not have to adhere over time to a consistent definition of one-time charge. With encouragement from the SEC, there are signs that the industry may be moving voluntarily to standards on such announcements.

Regulation FD provides for equal access to corporate information instead of allowing firms to disclose to selected analysts before informing outside investors. Predisclosure to analysts can potentially benefit investors with limited attention by providing them with predigested information. However, it may hurt credulous investors who fail to discount for the analyst's incentive to be favorable toward the firms they cover.

Limited attention can also explain the walk-down to beatable analyst forecasts in recent years documented by Richardson et al. (2000). Consider a compliant analyst who relies on managers for information. On the one hand, firms want analysts at long time horizons to forecast high, to favorably influence investor perceptions. On the other hand, as the evidence described earlier indicates, at the day of reckoning missing a forecast is a salient indicator of bad news; missing a forecast even slightly leads to a strong price reaction. So the firm encourages analysts to walk down the forecast to avoid this.

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<sup>51</sup> Coffee (1984, pp. 745–746) argues that critical adverse information was withheld from investors in municipal bond markets in which the Securities and Exchange Commission disclosure requirements do not apply, and that bond rating agencies were ineffective alternative sources of information to investors, leading to such problems as the difficulties with New York City's bond offerings in the 1970s, and the Washington Public Power System's failure in the 1980s. Nevertheless, Palmiter (1999) argues that in private placement offerings (which are exempt from Securities Act of 1933 disclosure requirements) issuers generally disclose information similar to or going beyond what is required for registered offerings, and many foreign issuers voluntarily choose to list on the New York Stock Exchange and reconcile its financial reports with Generally Accepted Accounting Principles with GAAP. On the other hand, in many countries it is evident that the level of disclosure voluntarily achieved is much less than that provided in the U.S.

<sup>52</sup> See, e.g., *Wall Street Journal*, 3/29/01, "Hazy Releases for Earnings Prompt Move for Standards," by Jonathan Weil.



Richardson et al. suggest that the appearance of this walkdown pattern in the last decade may be related to insider trading and disclosure regulations. These regulations have encouraged firms to limit trading by insiders to a short window of time after earnings announcements, all other times being part of a voluntary 'blackout period'. This increases the incentive for managers to ensure favorable market perceptions right after the earnings announcement. The increase in option compensation during the 1990s should have further increased the incentive for managers to beat forecasts. This illustrates the complexity of regulating markets when rationality is imperfect; the law of unintended consequences operates in full force.

Academics have often hailed the rise of stock option compensation as providing stronger incentives to managers. However, such compensation can make accounting reports less transparent because an option granted at the money is not recognized as an expense. This allows firms to boost earnings by paying managers in options rather than salary. If investors with limited attention incorrectly presume that a firm with a high non-saliently disclosed compensation burden is similar to that of more typical firms, they overvalue the firm. An alternative reporting scheme would be to expense options when granted at their Black–Scholes values. This approach would be flawed by model misspecification and the need to estimate model inputs. However, it seems hard to do worse than implicitly estimating the value of the option to be zero! Investors' misinterpretation of option compensation information emphasizes the economic importance of the form of presentation. The lack of saliency of heavy option compensation may have played an important role in the U.S. internet stock bubble and collapse, with its associated effects on resource allocation.

To improve information processing by investors, psychological principles (including attention effects, anchoring and adjustment) should be explicitly taken into account. Greater disclosure is not an unalloyed virtue, because investors can lose the forest for the trees. Clearly, important information that is hard for investors to process should be recognized and less important and easily processed information footnoted. Academic research can help determine both what information is important for valuation, and what information is most prone to neglect.

The SEC policy of requiring non-US firms to reconcile their accounting statements with US GAAP in order to be listed on US exchanges and to issue shares in the US may facilitate more accurate relative valuation of foreign firms by US investors. This helps reduce anchoring underadjustment bias if U.S. investors who are faced with non-US accounting earnings first focus on earnings, and then adjust insufficiently for differences in accounting. More generally, harmonization of accounting standards internationally is advantageous in reducing the cognitive burdens put on investors who wish to diversify internationally, and will tend to reduce the problem of inappropriate anchoring.

It has been proposed that firms be permitted to capitalize R&D expenditures (see Lev and Sougiannis, 1996). Judging the value of R&D tends to be a relatively open-ended problem, and often involves ambiguous or slow feedback. This can cause greater overconfidence and other psychological biases (Einhorn, 1980). So an accounting system that allows firms to capitalize instead of expensing R&D may

make it easier for firms to exploit investor misperceptions of growth prospects, by making current expenses seem like valuable assets. On the other hand, firms that convert current or future expenses into non-capitalized current R&D expenses (as has been alleged of ‘in process R&D’ in recent years) may be able to create the illusion of creating new intangible assets without the subsequent earnings hit associated with capitalizing R&D.

If investors were highly rational, the fact that firms manipulate accruals might not be a first-order policy concern. Rational investors can foresee and discount for such manipulation. In a sufficiently simple scenario, they may even be able to invert perfectly from reported earnings to ‘true’ earnings (in a fashion analogous to the model of Stein, 1989), so that in equilibrium the ability to manipulate does not affect investors’ information sets.

In contrast, if investors have limited attention, they may fail to discount for manipulation fully. The evidence in Section 4.2 that managers succeed in influencing investors’ perception by managing earnings is consistent with limited investor attention, and insufficient skepticism. If some investors, part of the time, focus their attention on earnings rather than its components, then accrual manipulation will affect prices. Of course, other smart investors will trade against accrual manipulation, but if risk bearing capacity is limited a mispricing effect will result. In times when the firm’s incentive to manage earnings upward is particularly large (e.g., around the time of new issues) but investors discount only for the ordinary level of manipulation, then investors will be fooled just when it counts.

The resulting misallocation of resources suggests that the discretion in accruals could be controlled more tightly. However, discretion is allowed in accruals for a reason: to reflect the economic condition of the firm in ways not yet reflected in current cash flow. Quantifying these tradeoffs awaits further research on capital market incentives (of managers and analysts) for earnings management and corporate governance influences on earnings management. Meanwhile, regulatory and media attention to the potential effects of accounting rules on capital market incentives to manage earnings (as expressed, for example, by SEC chairman Levitt in September 1998) can have a salutary effect by increasing investor awareness of the problems.<sup>53</sup>

Turning next to risk disclosure rules, the SEC allows disclosure of quantitative information about risk of derivative securities by means of VaR (Value at Risk), sensitivity analysis, or in tabular form (1997 release).<sup>54</sup> The asymmetric emphasis on large possible losses (rather than on overall variability) implicit in the VaR approach

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<sup>53</sup>The recent clarification of revenue recognition principles in SEC Staff Accounting Bulletin 101, by reducing firm discretion, can help improve investor understanding. Furthermore, investor governance activity through private investor groups (e.g., Council of Institutional Investors) in the 1990s and the regulatory changes such as the SEC 1992 Proxy Reform Act may have the effect of allowing investors to force greater transparency about compensation if they desire to do so (see, e.g., Johnson et al., 2000).

<sup>54</sup>The Value at Risk methodology involves estimation of the maximum possible loss, where generally the probability of a greater loss must be less than 5%. There is discretion about whether the loss is in terms of cash flows, earnings, or value. A sensitivity analysis describes the consequences for earnings, cash flows or value resulting from different possible realizations of an underlying security’s price. The tabular format presents information about the values of different assets and liabilities.

is in harmony with the psychological tendency to perceive risk in terms of the possibility of large possible losses ('dread').

When investors are subject to framing biases, Hodder et al. (2001) point out that flexibility in reporting risks can cause investors to make mistakes such as judging identical risks differently. They further suggest that the biased publication of news about large derivatives losses (as with Orange County and Barings) rather than gains is dread-inducing. Thus, they suggest that the use of derivatives to speculate is more likely than hedging to induce dread. Presumably this is because of the general aversion to active rather than passive blunders (omission versus commission bias). Even an *ex ante* reasonable hedge will frequently produce large losses *ex post*, and the omission/commission bias suggests that people will tend to be very concerned about losses from the hedge position (the active addition to the initial business risk). The focus of VaR on possible losses from the derivative position rather than offsetting gains caters to rather than combats dread. Potentially this could cause people to view a firm as more risky when it undertakes a risk-reducing hedge than when it does not. Risk disclosures that focus on total positions rather than just possible derivative losses, thus, may be superior.

Finally, theoretical models of disclosure often involves revealing a one-dimensional value measure. An interesting question is how much detail should be required in disclosure when information is multi-dimensional. This relates to the issue of the proper degree of aggregation in related items of accounting information. On the one hand disaggregation provides more information, and there are benefits to being able to break down complex decision problems into component parts. On the other hand, too much information can be hard to process — it is easier to process the bottom line than all the details. Furthermore, greater aggregation affects mental accounting for better or worse.

We have suggested that government can, through reporting regulation, help maintain consistent indicators of accounting value. A further simple means of encouraging consistent valuation of assets is to avoid actions that degrade monetary value measures generally.

In the popular press, inflation is a villain. On the whole this probably arises from confusion; a steady-state inflation is, to a first approximation, just a trivial change of units. There are important tax implications of inflation, but this does not seem to be the main reason people dislike it. For most people, the aversion seems more direct — a sense that inflation drains the value and buying power from their income and savings.

The evidence of money illusion mentioned earlier suggests that inflation is a likely source of faulty perceptions about investment performance and prospects.<sup>55</sup> More

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<sup>55</sup> Siegel (1998) discusses how high inflation biases earnings upward as an indicator of firms' profitability. During the high-inflation 1970s, in some regions the folk theory that real estate is an investment that cannot lose was popular. Shiller (2000b, p. 48) suggests that nominal growth in stock market and housing values tends to wipe out drops, creating a perception of low risk. Ritter and Warr (2001) provide evidence suggesting that inflation illusion contributed to the 1982–99 bull market. Probably one of the cheapest and most important things government can do to improve the quality of consumer and investor perceptions is to control long-run money growth to maintain an approximately zero long-run rate of inflation.

generally, there are many indicators of value whose meaning evolves over time. Given limited attention, we expect people to tend to adjust too slowly to these shifts. Shiller (2000a) discusses a continuing trend in this regard, with vastly more stock analyst buy than sell recommendations in 1998, in contrast with a nearly even division in mid-1983. He suggests that this has tended to make investors too optimistic.

## 8. Limiting freedom of action

If investors are imperfectly rational, actions and marketing may be regulated to prevent financial sharks from preying upon the ignorant, to prevent the ignorant from burdening other traders with noise trader risk (DeLong et al., 1990b), or to prevent the ignorant from damaging themselves. The latter concern is part of the debate over privatization of social security in the U.S.

A further reason for regulation is to prevent misallocation of resources. For example, the overpricing of internet shares surely directed real resources (especially human resources) toward internet-related firms during the internet boom of the late 1990s.

Some highly respected economists (Larry Summers and Joseph Stiglitz) have proposed transactions taxes on short-term securities trading to reduce short-term speculation. As argued in Section 1, it seems likely that liquidity-reduction would make the stock market less informationally efficient. The loss of efficiency would need to be weighed against savings in information acquisition and trading costs.

Should banks and S&L's be permitted to market mutual funds, IPOs, or junk bonds to depositors? These institutions are viewed as sober and safe, and deposits are insured. Some investors could be confused about the safety and downside protection of speculative investments if offered by these institutions. At a minimum, conspicuous disclosure that these investments are not insured would seem appropriate.

Some issues of investor credulity arises in regulation of advertising similar to those that arise for financial disclosure and reporting. In the law of fraud, half-truths (true statements that are misleading because of the omission of other material facts) are actionable (Langevoort, 1999). Highly rational individuals are unlikely to be harmed by half-truths in financial advertising, because the incentive of the seller of the financial service to mislead is often clear. For example, it is obvious why a mutual fund would advertise performance based upon a reporting period chosen *ex post* to maximize its reported return, and would selectively report benchmark indices for comparison.<sup>56</sup> But such selective reporting is potentially misleading to investors with limited attention.<sup>57</sup>

<sup>56</sup> Elton et al. (1989) describe misleading marketing and press coverage of commodity mutual funds, and the presentation of such funds as conservative hedges against inflation. Barber and Odean (1999) discuss advertising of online trading aimed at investor's biases, such as overconfidence and the illusion of control.

<sup>57</sup> Standardizing the advertising of fund results would be a modest step forward. Unfortunately, it would not solve the selective survivorship problem wherein fund families start numerous funds and then advertise the most successful ones.

It is not obvious, in a fully rational world, that the SEC should prosecute internet chat-room stock price manipulators who play the ‘pump and dump’ game. Rational investors should understand that anonymous internet chat comments are cheap talk. Consistent with earlier discussion, episodes of successful manipulation of this sort suggest excessive credulity on the part of investors.<sup>58</sup> More broadly, each year investors are defrauded by get-rich-quick scams, so at a minimum the extreme tail of gullibility is severe.

There is a grey area between fraud and legitimate self-promotion. Advertising standards (for example, requiring that fund that advertise past performance use comparable return calculations) may help partly dissipate the fog. In principle the market can fix upon such standards on its own, and rating services such as Morningstar can provide investors with objective comparisons. There are, however, coordination problems in getting a standard started, and some investors do not check the ratings.

Investors can be helped by regulation that sets ground rules for the provision of financial advice by intermediaries. Most finance academics have come across several howlers offered by investment advisors. More generally, investors are excessively willing to pay for, and be influenced by, fast-talking brokers and investment advisors. Fraudulent schemes are just the extreme end of a continuum. The marketing by brokers of overpriced closed-end-fund IPOs is another example (Lee et al., 1990). There is a conflict between the advisory role of stock brokers, and their incentives to stimulate client trading, and to steer trades toward high-commission securities.

Both the positive and negative aspects of broker advice probably depend on investor psychology. On the whole brokers are probably not providing inside information, but may help the investor make use of publicly available information. On the other hand, the broker may act as a salesman to manipulate the irrationalities of investors. Langevoort (1996) describes exploitive sales techniques used by brokers.<sup>59</sup> He also argues that manipulative selling techniques, tailored appropriately, work on institutional as well as individual investors. Jain and Wu (2000) provide evidence that investors do respond to marketing pressures by brokers and to mutual fund advertising. In a related vein, Brennan and Hughes (1991) offer an explanation for why individuals investors disproportionately hold small stocks based on the higher brokerage fees obtained by brokers in the U.S. for low-priced shares.

There has been much criticism of analysts for their reluctance to make adverse recommendations, and for their personal ownership stakes and their firms’

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<sup>58</sup> In one recent case a 14-year-old spread favorable rumors about thinly trading stocks using numerous fictitious names, and immediately dumped the stocks (Bloomberg, 9/21/00). The SEC alleged that he made \$272,826 in profits on stocks he touted and sold.

<sup>59</sup> Although used even by reputable brokerages, hard sell techniques are exploited most heavily by firms that specialize in pushing penny stocks (low-priced, thinly traded, over-the-counter securities) through cold calls. SEC regulations of penny stock marketing have increased paperwork and slowed down investors’ decisions, thereby disrupting the hard sell. Such restriction of investor and broker freedom is, we would argue, reasonable to consider given the presence of predatory marketers and unsophisticated customers.

underwriting ties with companies they evaluate. Recently there have been increasing pressures and efforts to address these issues.<sup>60</sup> The free market position is that there is no problem, as investors are free to discount the recommendations. However, if investors are excessively credulous, then analyst biases can harm investors and make the market less efficient. The evidence from Section 3.1.7 that analyst sell recommendations are strong predictors of low future returns whereas analyst buy recommendations are not strong predictors of high returns suggests that investors do not fully adjust for analyst biases. Investor skepticism gives analysts incentives to build reputations for accuracy, rather than acting as stock promoters. If investors are excessively credulous, then they can be harmed by poor recommendations, and the pressure on analysts to be accurate is weakened.

Brennan (1995) discusses how intermediaries can profit from building a good reputation, so that individual investors who lack expert knowledge can gain from the expertise of intermediaries. But what if investors do not know enough to judge good and bad reputations? For example, it is hard for most investors to determine whether whole life policies offered by major insurance companies have been good investments. More generally, there is much noise in financial outcomes so it is hard even for careful investors to know whether a manager's reputation is skill or luck.

The biases in choices in retirement investments described in Section 2 (naive diversification, price-trend-chasing, non-diversification, procrastination/inertia, and status quo bias) are severe and momentous. Evidence of time-inconsistent preferences and problems of self-control further suggest that the amount of retirement saving is likely to be too small. These findings suggest that errors are likely to have large effects on many investors' lifetime wealths and quality of life. Given the gravity of the problem, it is tempting to endorse paternalistic solutions. Most developed countries have adopted 'social insurance', as with Social Security and Medicare in the U.S. However, less heroic measures should be considered.

For example, in defined contribution retirement plans, default options can be designed to encourage wise choices. To protect investors from procrastination/inertia and the status quo bias, the default can be a mixture of stocks, bond and other assets in reasonable proportions. Investors who want to decide for themselves will do so, so the loss of freedom is nil. It may also be helpful to require companies to give warnings to their employees about the risk of investing retirement funds in their own company's stock instead of diversifying.

To address naive diversification (Benartzi and Thaler, 2001), requiring the completion of a structured worksheet may help. People can be asked first to allocate

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<sup>60</sup> In December of 2000 Prudential Securities Chairman and Chief Executive John Strangfeld set a policy for his firm's analysts of saying 'sell' to mean sell rather than using misleading substitutes such as 'market perform' or 'neutral'. On 5/17/01 a U.S. House subcommittee opened hearings on how analysts conduct their activities. On 6/12/01 the Securities Industry Association adopted 'Best Practices' guidelines designed to make analysts less dependent on pressures to help the firm gain investment banking fees. On 7/2/01 the National Association of Securities Dealers proposed rules that analysts and brokerage houses disclose ownership in or investment banking dealings with companies that they cover. On 7/10/01, Merrill Lynch announced that it will bar analysts from buying shares in the firms they cover (see *WSJ*, 7/11/01, "Merrill Alters a Policy on Analysts", P. C1).

contributions between stocks, bonds, and other assets. Only after they have done so would they be permitted to subdivide each account among different stock funds, bond funds, and so on. We conjecture this would weaken the tendency for people to allocate far more to stocks when more stock funds are on the menu (in accordance with naive diversification). A more drastic solution (which we do not prefer) entailing greater loss of freedom would be to limit sharply the number of funds of different kinds available in the retirement plan. Further experimental research can help determine what approaches are likely to be most effective.

## **9. Conclusion**

We have argued that there is now persuasive evidence that investors make major systematic errors. We further argue, though it is not absolutely a prerequisite for most of our policy conclusions, that the evidence is persuasive that psychological biases affect market prices substantially. Furthermore, there are some indications that as result of mispricing there is substantial misallocation of resources in the economy. Thus, we suggest that economists should study how regulatory and legal policies can limit the damage caused by imperfect rationality.

But do not hand the car keys to junior just yet. Obviously, interest group politics distorts (or dominates) public discourse and government activity, with perverse results. Even if voters and officials sought solely to serve a broad public interest, there is no reason to think that regulators, politicians, courts, or individual voters are less subject to bias than are market prices — far from it. This suggests that detecting and responding to market pricing errors is not the government's relative advantage.

Emotions and psychological biases in judgment and decision seem to have important effects on public discourse and the political process, leading to mass delusions and excessive focus on transiently popular issues. If individuals were fully rational in their market and political judgments, there would be a case for government intervention to remedy informational externalities in capital markets. The case against such intervention comes from the tendency for people in groups to fool themselves in the political sphere, and for pressure groups to exploit the imperfect rationality of political participants. These failings of the political process provide a case for creating political institutions that are tilted against governmental intervention in capital markets. This applies to the making of *ex ante* rules, and even more strongly to policies designed to correct alleged market mispricing *ex post*.

However, we do argue that there is a good case for some minimally coercive and relatively low-cost measures to help investors make better choices and make the market more efficient. These involve regulation of disclosure by firms and by information intermediaries, financial reporting regulations, investment education, and perhaps some efforts to standardize mutual fund advertising.

More controversially, a case can be made for regulations to protect foolish investors by restricting their freedom of action or the freedom of those that may prey upon them. Limits on how securities are marketed and laws against market manipulation through rumor-spreading may fall into this category.

There is little cost to requiring companies to provide a standard warning, analogous to cigarette warning labels, to workers of the risks of plunging retirement money in their own company's stock. Regulating the way in which retirement investment options are presented to individuals (e.g., the status quo choice, and how choices are categorized) may have low cost yet may greatly affect lifetime outcomes. Especially, maintaining zero long-term average inflation would eliminate money illusion problems, including problems in remembering and comparing prices of goods and problems in assessing past investment returns.

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