

**ALPHANOMICS:  
The Informational Underpinnings of Market  
Efficiency**

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## **FOREWORD**

Assumptions matter. They confine the flexibility that we believe is available to us as researchers, and they define the topics we deem worthy of study. Perhaps more insidiously, once we've lived with them long enough, they can disappear entirely from our consciousness.

Mainstream accounting and economic thought is shaped by the assumptions of classical information economics -- the study of normative behavior under full rationality assumptions. While this powerful paradigm has proved highly instructive, it has also engendered an unfortunate tendency for economists to attribute unlimited processing ability to decision makers. We view this tendency as unfortunate, because it can inhibit the development of other potentially promising avenues of research.

In the area of research into financial markets, the assumption of unbounded rationality has produced a deep-seated faith in market efficiency that, for many years, detracted from potentially fruitful inquiries along alternative paths. As economists, we tend to take for granted the efficacy of the arbitrage mechanism, generally assuming that it involves few constraints, and little cost or risk. Faith in the arbitrage mechanism has stunted the development of research in mainstream economics on the dynamic process of information acquisition, analysis, and aggregation. Market prices are often presumed to be correct, as if by fiat, and the process by which they become correct is trivialized.

The depth of our collective faith in market efficiency is evident from our course offerings. At most top business schools today, investment classes are taught by financial economists trained in equilibrium thinking. In these classes, the efficient market hypothesis (EMH) is typically offered as the intellectual high ground -- an inevitable outcome of rational thinking. Students are taught that market-clearing conditions require prices to reflect all currently available information. This line of reasoning persists, despite the fact that it conforms neither to logic nor to evidence.

Why do we believe markets are efficient? Are these beliefs well-grounded? What are the economic forces that keep markets efficient? How, when, and why might such forces fail? If we choose to depart from the assumption of full efficiency, what alternatives do we have? Can we

do so without abandoning faith in individual rationality? And what might a sensible research agenda look like for accounting and finance academics if markets were not fully efficient? These are some of the questions we will explore in this monograph.

Implicitly or explicitly, each researcher working in the capital market area must come to terms with these questions. The degree to which markets are efficient affects the demand for accounting research in investment decisions, regulatory standard-setting decisions, performance evaluations, corporate governance, contract design, executive compensation, and corporate disclosure decisions. One's belief about market efficiency also dictates our research design, and in particular the role played by market prices in the analysis. Perhaps most importantly, given the intended audience of this volume, one's view about market efficiency will have a profound effect on the shape of one's research agenda. In fact, what a researcher chooses to study in the capital market area is, we believe, largely a function of her level of faith in the informational efficiency of these markets.

It has been 35 years since Michael Jensen famously proclaimed at a *Journal of Financial Economics* (JFE) symposium: "I believe there is no other proposition in economics which has more solid empirical evidence supporting it than the Efficient Market Hypothesis." (Jensen (1978, p95)). Less often quoted, but perhaps even more on the mark, were Jensen's remarks at the end of the same article. Commenting on the evidence presented at the symposium about market pricing anomalies, he wrote: "I have little doubt that in the next several years we will document further anomalies and begin to sort out and understand their causes. The result will not be abandonment of the 'efficiency' concept, nor of asset pricing models. Five years from now, however, we will, as a profession, have a much better understanding of these concepts than we now possess, and we will have a much more fundamental understanding of the world around us." This monograph is an attempt to summarize what we have learned since, and what we as a profession have to look forward to in the future.

As this is written, the winners of the 2013 Nobel Memorial Prize in Economics have just been announced. This year the prize was shared by three Americans – Eugene Fama, Lars Peter Hansen, and Robert Shiller. For many of us who have followed the EMH debate over the years,

the decision to honor Fama and Shiller together is not without irony, given the radical differences in their views on the subject. Fama is being honored for his work in the 1960s showing that market prices are accurate reflections of available information. Shiller is honored largely for circumscribing that theory in the 1980s by showing that prices can deviate from rationality. In awarding them the prize, the Royal Swedish Academy of Sciences notes that collectively the three professors' work "laid the foundation for the current understanding of asset prices." In characterizing this contribution, the committee said their findings "showed that markets were moved by a mix of rational calculus and human behavior."

*Markets are moved by a mix of rational calculus and human behavior.* We have certainly come a long way since the days of the 1978 JFE symposium! As Jensen predicted, financial economists have not abandoned rational calculus or the concept of 'efficiency.' We understand and still appreciate the power of equilibrium thinking. At the same time, however, after 35 years, we have also come to acknowledge the importance of human behavior and arbitrage costs in asset pricing. As a profession, many more of us are now willing to entertain, and wrestle with, the limitations and problems of an imperfect market. In this sense, we have indeed come to a much better place in terms of our understanding of the world around us.

In recent decades, the focus of academic research on market efficiency has gradually shifted from the general to the more specific. While earlier studies tended to view the matter as a yes/no debate, most recent studies now acknowledge the impossibility of fully efficient markets, and have focused instead on factors that could materially affect the timely incorporation of information. An extensive literature in finance has developed that examine the effect of "noise trader demand", or "investor sentiment" (broadly defined as price pressures of a non-fundamental origin). As we cover in more detail in Chapters 2 and 4, there is now substantial evidence that investor sentiment can affect asset pricing, as well as real economic decisions (such as corporate finance, investments, dividend policies, and disclosure decisions).

At the same time, increasing attention is being paid to how regulatory and market design issues could either impede or enhance market pricing efficiency through their effect on information arbitrageurs. Recent evidence on the limits of arbitrage highlights the complexity and non-

monotonicity of the process through which prices converge towards fundamental value. To better understand the relationship between prices and information flows, we need to gain a deeper appreciation for how rational information arbitrage actually operates.

Whatever one's view is of market efficiency, few scholars today deny the fact that active asset management, with "beating the market" as its central mandate, is today a large and thriving business. The reason our financial markets are even remotely efficient, is because sufficient resources are being spent each day on keeping it so.<sup>1</sup> The agents who acquire and process new information aspire to making a profit from their investment. Their continued survival speaks powerfully to magnitude of the aggregate mispricing in equilibrium. At the same time, these purveyors of information face a complex production function, with multiple costs and risks, including: time-varying capital constraints, moral hazard problems, risk management issues, security lending costs, and various practical implementation challenges. This monograph, and in particular, Chapter 5, will highlight some of these limits to arbitrage.

In short, our goal is to present and promote a more nuanced view of market efficiency. In our view, a naïve form of efficiency, in which price is assumed to equal fundamental value, is a grossly inadequate starting point for much of today's market-related research.<sup>2</sup> To us, this is an over simplification that underweights the role of costly information and fails to capture the richness of market pricing dynamics and the process of price discovery. Prices do not adjust to fundamental value instantly by fiat. In reality market prices are buffeted by a continuous flow of information, or rumors and innuendos disguised as information. Individuals reacting to these signals, or pseudo-signals, cannot easily calibrate the extent to which their own signal is already reflected in price. This noisy process of price discovery requires time and takes effort, and is only achieved at substantial cost to society.

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<sup>1</sup> As discussed in more detail in Chapter 1, we estimate the amount of asset-under-management (AUM) controlled by professional *active* managers to be at least \$60 trillion USD as of the end of 2012. The U.S. mutual fund market alone exceeds \$6 trillion, and the hedge fund market is at least \$2 trillion (See the 2013 Investment Company Factbook, available at <http://www.icifactbook.org/>). Thus it clearly takes a great deal of capital and resources to attain the level of pricing efficiency we currently enjoy.

<sup>2</sup> Throughout this discourse, fundamental value is defined as the expected value of future dividends, conditional on currently available information. See Chapter 1 for a more detailed definition of the efficient market hypothesis (EMH).

When information processing is costly, research opportunities abound. Given noisy prices and costly arbitrage, academic research can add value by improving the cost-effectiveness of the arbitrage mechanism.<sup>3</sup> Some of this research will lead to superior techniques for identifying arbitrage opportunities. Other research will focus on sources of systematic noise, exploring behavioral and non-fundamental reasons why prices might diverge from value. Still others, such as work on earnings quality or fundamental analysis, will help to narrow the plausibility bounds around the value estimates of traded securities.

Finally, research into arbitrage constraints and market design issues can help us to better understand and manage the costs faced by those who seek to acquire information and make markets more efficient. How might the incentives of these agents be affected by changes in security market regulations and mandatory corporate disclosure rules (such as fair value accounting or the adoption of IFRS)? How is the information acquisition and alpha extraction process being impacted by Big Data? To us, a wide world of research opportunities opens up once we are willing to lift the hood, and peer behind the assumption of market efficiency.

Much of this research has a utilitarian focus. It is decision driven, interdisciplinary, and prospective in nature. It assumes a user, rather than a preparer, orientation towards accounting information. It does not assume the market price is equivalent to fundamental value. Rather, it produces independent estimates of firm value that may be used to challenge, and perhaps discipline, prices. Its end goal is to improve the allocation of scarce resources through more cost-effective usage of information in solving significant problems in financial economics.

This monograph is dedicated to the kind of decision-driven and prospectively-focused research that is much needed in a market constantly seeking to become *more* efficient. We refer to this type of research as “Alphanomics”, the informational economics behind market efficiency. The “Alpha” portion refers to the abnormal returns, or financial rewards, which provide the incentive for some subpopulation of investors to engage in information acquisition and costly arbitrage

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<sup>3</sup> We define arbitrage as information trading aimed at exploiting market imperfections. As discussed later, this definition is broader than the definition found in some finance textbooks.

activities. The “Nomics” refers to the economics of alpha extraction, which encompasses the costs and incentives of informational arbitrage as a sustainable business proposition.

We caution the reader on two caveats. First, the evidence we survey here focuses primarily on equity securities, and in particular public equities listed in the U.S. We acknowledge that in finance, an extensive literature explores related topics across multiple asset classes in a more global setting. Although this literature is covered only tangentially by this volume, many of the same principles discussed here apply across other asset classes. Second, we are focused on market efficiency in an informational sense – i.e., whether and how prices incorporate available information. Tobin (1984) entertains a broader definition of economic efficiency which we find intriguing, particularly his views on the “functional efficiency” of free markets. For parsimony, our monograph does not tread in that direction, but interested readers are encouraged to include Professor Tobin in their list of must-read references.

This volume is itself interdisciplinary. The first two chapters in particular draw heavily from the writings of financial economists. In Chapter 1, titled “The Magic of Markets,” we revisit the theoretical foundations of the EMH, and discuss some of the limitations and biases it engenders. Some have compared the EMH to “Newtonian physics” in the sense that while we know it does not hold precisely, the theory is a safe operating assumption for practical purposes. We critically evaluate this claim, and discuss situations where the EMH falls particularly short.

Chapter 2 introduces a simple Noise Trader Model (“NTM”) first featured in Shiller (1984). A particularly appealing aspect of the NTM is its explicit recognition of the role played by information costs. In contrast to the EMH, which assumes information costs are trivial, the role for information arises endogenously in the NTM and the cost of information acquisition and analysis has direct implications for equilibrium pricing.<sup>4</sup>

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<sup>4</sup> Noisy rational expectation models, such as Grossman (1976), Grossman and Stiglitz (1980), and Diamond and Verrecchia (1981), also feature noise traders and other informed traders, who incur costs in order to become informed. We discuss the most salient differences between the NTM and these models in Chapter 2.

Chapter 3 examines equity valuation. An independent estimate of firm value is needed if information arbitrageurs are to challenge and discipline price. We discuss the role of historical accounting information in the formulation of such an estimate. Specifically, we review the fundamental economics that link historical financial statement numbers to a firm's fundamental value. Using the residual income model (RIM) as a framework, we integrate the investment approaches advocated by such legendary investors as: Ben Graham, Warren Buffett, and Joel Greenblatt. This analysis shows that the strategies espoused by these investors actually dovetail nicely with the recent evidence from academic research on the predictability of stock returns.

Chapter 4 expands the discussion of Investor Sentiment. Financial economists have long observed that stock prices seem to respond to price pressures that cannot be easily traced back to fundamentals (e.g., Roll (1984), Black (1986), Cutler, Poterba, and Summers (1999)). In this chapter, we survey the extensive literature on noise trading and investor sentiment that has developed over the past three decades. We show that evidence in favor of a role for human behavior and investor sentiment in asset pricing is now extensive. We also discuss the implications of these findings for the future of accounting research.

Chapter 5 examines Limits to Arbitrage. In the NTM, the extent to which prices may wander away from fundamentals is a function of the costs faced by informed arbitrageurs. Thus reducing arbitrage costs will lead directly to greater pricing efficiency. We dissect the major components of these costs using the concept of "asset substitutability," and discuss how each component might impact common investment strategies employed by hedge funds. We also discuss academic studies that shed light on the cost constraints faced by arbitrageurs.

Chapter 6 focuses on Research Methodology. In this chapter, we review research design issues for academics interested in working on questions related to market efficiency. Specifically, we discuss techniques for distinguishing between whether a predictable pattern in prices is due to risk or mispricing. We also speculate on future research directions in this area, using recent studies as illustrations.

In sum, this monograph may be viewed as our attempt to reconcile the *theory* of market efficiency, so popular among academics, with the *practice* of active investing, so prevalent in industry. Active investing is big business, and it is rooted in the basic premise that the search for information not yet reflected in prices can be a worthy pursuit. It is difficult to begin serious academic analyses of this industry without an economic framework that anticipates the continued existence of mispricing in equilibrium. We offer such a framework.

At the same time, we hope this monograph will serve as a conceptual bridge for future dialogue between academics and financial practitioners. For academics, our hope is that this volume will help you to better appreciate the perspective of active investors who make a living attempting to beat the market. For financial practitioners, this is our attempt to provide a framework for thinking about active investing as a science, and to bring together a volume of academic work that may bear on your efforts to improve market efficiency.

We hope you enjoy the ride.

## References

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# Chapter 1

## The Magic of Markets

In this chapter, we trace the progression of economic thought on market efficiency.<sup>5</sup> We discuss what is meant by the efficient market hypothesis (EMH), and some of the most pressing problems an undue reliance on market efficiency has engendered in the profession. Beginning with Hayek (1934), we review the informational role of markets in free enterprise systems. We then discuss the untenable case for perfectly efficient markets (Grossman and Stiglitz (1980)) and argue for a broader research agenda that recognizes the importance of the market for information.

### *1.1 The Value of Markets in Society*

In his justly famous treatise on the subject of knowledge aggregation in society, Hayek (1945) contrasted centralized-planning with a market-based economy based on decentralized decision making. Hayek noted that economic planning involves two types of knowledge: (1) scientific knowledge (knowledge about theoretical or technical principles and rules), and (2) specific knowledge (knowledge of particular circumstances of time and place). Recognizing that even the best central planner does not have adequate access to knowledge of the second type, Hayek argued that market-based economies in which resource allocation decisions are decentralized will always dominate centralized planning. This is because in a rational economic order, efficient social planning will always depend on “the utilization of knowledge not given to anyone in its entirety” (p.520).

With the benefit of hindsight, the genius of Hayek is clear. After WWII, multiple country-level paired-experiments emerged that offered a remarkable glimpse into the power of market-based planning: North and South Korea; East and West Germany; Taiwan and Communist China. In each case, holding constant cultural and genetic factors, decentralized economies dominated centrally-planned ones. This dominance is seen not merely in terms of personal economic wealth (i.e. per capita GDP). On almost every conceivable metric of social wellness (Education;

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<sup>5</sup> For other survey studies that cover overlapping themes, see Lee (2001), Richardson, Tuna, and Wysocki (2010), Asness and Liew (2014), and Campbell (2014).

Opportunity; Nutrition and Healthcare; Life Expectancy; and Basic Human Needs), the market-based systems dominated.<sup>6</sup> As Margaret Thatcher, champion of the free market gospel, once quipped: “capitalism *is* humanitarianism.” In short, markets work and there is little wonder that the 20<sup>th</sup> century has been called “the Hayek Century” (Cassidy (2000)).

But what gives the market economies their magic? It boils down to better resource allocation via decentralized decision making. As Hayek observed, the essential planning problem of society involves rapid adaptation to changing circumstances. It is an information game that the central planner cannot hope to win. It follows then that “the man (woman) on the spot” is the best person to make resource allocation decisions.<sup>7</sup>

What is the role of *prices* in all this? Consider what the “man (woman) on the spot” needs to make resource allocation decisions. As a minimum, she needs to know the relative scarcity of things – the value of the inputs and outputs relevant to her decision. This information is quickly and succinctly summarized by prices. The pricing system is a vital knowledge aggregation mechanism in free markets. To the extent that market prices are meaningful indicators of relative scarcity, they help facilitate decentralized planning. Price, in short, is a *public good* that is essential in enabling decentralized decision-making.

Given these basic tenets of free market economics, the efficiency with which market prices assimilate new information assumes an importance beyond academic debates over the size of the abnormal returns earned by hedge fund managers. If the prices of things drive decentralized decisions and decentralized decision-making drives free enterprise systems, then prices play a pivotal role in economic proliferation by revealing the value of scarce resources. This is because free enterprise economies depend on their markets to set prices, which in turn determine resource allocation throughout the system.

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<sup>6</sup> A good resource for those interested in broad measures of social progress is: [www.socialprogressimperative.org](http://www.socialprogressimperative.org).

<sup>7</sup> Hayek argued that due to this information game, planning must be decentralized. Government intervention in a free market only serves to forestall economic ailments and could lead to political oppression. In the *Road to Serfdom*, he warns ominously: “the unforeseen but inevitable consequences of socialist planning create a state of affairs in which, if the policy is to be pursued, totalitarian forces will get the upper hand.”

We thus draw two key lessons from Hayek: (1) the informational role of markets in knowledge aggregation is of great value to society, and (2) asset prices that reflect the value of goods (and services) are central to the development of free market systems.

Notice, however, that neither Hayek, nor the broader Austrian school of economics to which he belonged, was focused on the specifics of *how* markets become efficient, or *when* the knowledge aggregation process might fail. These earlier works were focused on the central battle of their day: whether market systems are better than centrally planned ones. They are largely silent with respect to the economics of information acquisition and analysis, and the factors that might cause markets to become more or less price efficient. These issues were not their primary concern.

The idea that markets serve as powerful aggregators of knowledge, first proposed by Hayek, has in our day morphed into what we refer to as the EMH. In the next subsection we discuss why this turn of events has led to some inevitable problems.

### *1.2 The Joint Equilibrium Problem*

What is our main objection to the EMH? Let's begin with what we do not object to. First, we recognize that markets are wonderful aggregators of information. Second, like proponents of the EMH, we appreciate the power of equilibrium thinking. Third, we acknowledge that not everyone should be trying to beat the market. In fact, we concur with EMH proponents that *most* individuals are better off assuming prices are reasonable indicators of the relative scarcity of resources in society. All of these conclusions are consistent with Hayekian thinking.

Where we disagree with EMH proponents is in the assumption that the costs associated with informational arbitrage are trivial or unimportant. Like Hayek, we believe the price discovery and information aggregation process is central to the social value of markets. Some economists today believe the EMH is the "moral high ground", arguing that the existence of mispricing necessarily implies off-equilibrium (non-economic or irrational) thinking. In fact, we believe the exact opposite is true. In terms of equilibrium thinking, it is the EMH that is conceptually flawed and intellectually untenable.

Statements regarding the efficiency of market prices must first recognize the existence of two interrelated but distinct markets. In addition to the market for the assets themselves, if information is costly, we will have a separate market for information about these assets. Participants in this second market buy and sell information about the underlying assets. These participants incur costs to ‘buy’ (i.e., acquire) information with the expectation that they can ‘sell’ (i.e., convey) the information to the market in exchange for direct fees, in the case of research analysts, and/or trading profits, in the case of investors. Equilibrium requires both markets to clear. In other words, supply must equal demand in *both* markets.

In discussing the impossibility of perfectly efficient markets, Grossman and Stiglitz (1980) make the following observation:

*We have argued that because information is costly, prices cannot perfectly reflect the information which is available, since if it did, those who spend resources to obtain it would receive no compensation. There is a fundamental conflict between the efficiency with which markets spread information and the incentives to acquire information. [p.405]*

Their point is simple. When information costs are non-trivial, some amount of mispricing must remain in equilibrium. This must be the case if informed traders are to be sufficiently compensated. In other words, market clearing conditions in this joint equilibrium (when supply equals demand in both markets) require asset prices to bear the marks of inefficiency.

Given the inextricable link between these two markets, focusing on either in isolation would be foolhardy. If we focus solely on the asset market, for example, we will observe “pricing anomalies”, whose roots lie in the market for information. These asset pricing aberrations can only be understood in the context of supply and demand in the parallel market for information. Larger mispricings will remain, for example, when the cost of acquiring and exploiting information about a firm is higher. This might be the case if the company’s operations are more complex, its accounting is more opaque, or if informational extraction costs, such as market

liquidity and short-selling costs (i.e., the costs of profitably exploiting value-relevant information) are higher.<sup>8</sup>

Our point is that financial economists need to pay more attention to the costs and incentives in the market for information. The reason *most* individuals in society can rely on market prices to make their everyday decisions is because *some* individuals in society do not. While it might be alright for most (even the vast majority of) individuals in society to assume “the price is right” – that is, to free ride on the efforts of information arbitrageurs – economists that study how markets operates should not be counted among them.

Most people can assume a car will run each time the key is turned, however the auto mechanic cannot afford to do so. Likewise economists interested in the informational role of markets also need to look under the hood. We believe it would be an abdication of responsibility not to.

### *1.3 What do we mean by market efficiency?*

Stripped down to its core, the efficient market hypothesis (EMH) is the simple proposition that market prices incorporate all available information. The original EMH literature is careful to condition this statement on a particular set of available information (e.g., Fama (1965, 1970, 1991)). Different forms of the EMH (strong, semi-strong, and weak) are then defined in terms of the rapidity and accuracy of price adjustment to news within different information sets. Early applications of the EMH in accounting also acknowledged that the speed and accuracy of price adjustment to new information is a continuous process, and does not occur instantaneously (e.g., Dyckman and Morse (1986; page 2)).

Most empirical tests of market efficiency have focused on the predictability of returns. The idea is that if current market prices incorporate all available information, then future returns should be largely unpredictable. Or, at least any patterns of predictability that we observe in future returns should not be easily exploited after transaction costs. This version of the EMH is often evoked,

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<sup>8</sup> Blocher et al. (2013) provides an excellent example of the joint equilibrium problem in the context of short-selling constraints. Empirically, Beneish et al. (2013) links this phenomenon to nine well-known pricing anomalies in the equity market.

for example, in deriving equilibrium conditions in asset pricing models. It has been variously referred to as the “competitively efficient markets” hypothesis (Rubinstein (2001)), or the “no arbitrage condition”. An even more descriptive moniker, we think, is the “**No Free Lunch**” assumption. Markets that are in equilibrium should rarely, if ever, offer a free lunch.

Tests of the “no free lunch” hypothesis run quickly into a serious challenge, which Fama (1970, 1991) famously refers to as the “joint hypothesis problem”.<sup>9</sup> To make any statement about market efficiency, we need to assert how the market *should* reflect information – in other words, we need an equilibrium asset pricing model. For example, the Capital Asset Pricing Model (CAPM) states that the expected return on any security is proportional to the risk of that security as measured by its market Beta, and nothing else should matter. Suppose we find evidence against the predictive power of Beta for cross-sectional returns. One possibility is the EMH holds, but CAPM is a poor model of how investors set prices. Perhaps prices do reflect all information, but there are other risk factors besides Beta that investors are being compensated for bearing. Another possibility is that the CAPM is in fact how investors *should* set prices, but they are failing at it because of some sort of behavioral error or bias. Yet a third possibility is that both EMH and CAPM are wrong. It is difficult to sort out where the problem lies.

It has been argued that the joint hypothesis problem renders the EMH impossible to conclusively reject (Fama (1970, 1991)). We agree that this problem limits what researchers can say about market efficiency on the basis of return predictability alone. However, it does not leave us paralyzed and powerless. We believe there are now multiple methods for evaluating the reasonableness of a claim about market mispricing besides returns prediction. Some of these involve examining ancillary evidence about firms’ future cash flows, operating profits, short-window earnings announcement returns, analyst forecast revisions, probability of distress or delisting, or short-sale activities, etc. Others studies (for example, Daniel and Titman (1997), Hirshleifer et al. (2012) and Ohlson and Bilinski (2012)) rely on common sense “reasonableness” tests to distinguish mispricing-based from risk-based explanations for returns predictability. The main point being as researchers, we now have at our disposal a large set of holistic, “weight of

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<sup>9</sup> See Asness and Liew (2014) for a good discussion of the work by Fama and Shiller from the perspective of former academics who are now active fund managers. Campbell (2014) provides a more academic review of their work.

evidence,” approaches that helps us to discriminate between risk and mispricing (this is the main subject of Chapter 6; we also touch on it in this chapter, in Section 1.7.3).<sup>10</sup>

As difficult as it might be to disprove the “**No Free Lunch**” hypothesis, this version of the EMH is not the main problem. As capital market research has evolved over time, a much stronger and more insidious form of the EMH has gained currency. It is what we refer to as the “**Price is Right**” hypothesis. Applied to equity markets, this view of market efficiency asserts that a company’s stock price is an optimal forecast of the present value of its expected future dividends ( $P_t = V_t, \forall t$ ). Notationally, this view is often expressed in the following form:

$$P_t = V_t \equiv \sum_{i=1}^{\infty} \frac{E_t(D_{t+i})}{(1+r)^i}, \quad (1)$$

where  $V_t$  is defined as the stock's fundamental value at time  $t$ ,  $E_t(D_{t+i})$  is the expected future dividend for period  $t+i$  based on information available at time  $t$ , and  $r$  is the appropriate risk-adjusted discount rate for the expected dividend stream. Equation (1) asserts that  $P_t$ , the stock price at time  $t$ , is equivalent to the expected value of future dividends,  $V_t$ .

Over time, the Price is Right view of markets has acquired the status of an operating assumption among many researchers. For example, in the information content literature in accounting (including both short-window event studies and long-window association studies), price is commonly interpreted as a de facto proxy for the expected value of future dividends, and stock returns are deemed to reflect changes in the present value of expected future dividends. In the extensive value-relevance literature (Holthausen and Watts (2001) and Barth et al. (2001)), price is deemed to be a normative benchmark for firm value. The assumption that price is equivalent to the present value of expected future dividends appears more explicitly in valuation studies, typically as the first assumption in the paper (e.g., Feltham and Ohlson (1999), Zhang (2000), Dechow et al. (1999)).

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<sup>10</sup> Also see Richardson, Tuna, and Wysocki (2010) for a discussion of non-price based tests that can help discriminate between risk and mispricing based explanations for returns predictability.

In finance, this assumption has become a cornerstone of empirical asset pricing, particularly when interpreting realized returns. For example, highly influential work by Campbell (1991) and Vouteenaho (2002) decompose realized returns under the assumption that movements in stock prices mirror movements in  $V_t$ . In a zero-sum attribution exercise where price equals value, what is not attributable to cash flows is, of necessity, attributed to discount rates. Thus, due to an uncritical application of the EMH, the unexplained volatility in stock prices is now widely interpreted in the empirical asset pricing literature as evidence of time-varying expected returns.<sup>11</sup>

The problem is that “No Free Lunch” does not imply “The Price is Right”. In his seminal study on the role of mass psychology in markets, Robert Shiller (1984) made the following observation:

Returns on speculative assets are nearly unforecastable; this fact is the basis of the most important argument in the oral tradition against a role for mass psychology in speculative markets. One form of this argument claims that because real returns are nearly unforecastable, the real prices of stocks is close to the intrinsic value, that is, the present value with constant discount rate of optimally forecasted future real dividends. *This argument for the efficient market hypothesis represents one of the most remarkable errors in the history of economic thought. It is remarkable in the immediacy of its logical error and in the sweep and implications of its conclusion (Shiller (1984), p.458-59)). [emphasis ours].*

With a little thought, Shiller’s point becomes obvious. If price is equal to value at all times, then indeed returns will be unforecastable. In other words, if the price is always right (“A”), then

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<sup>11</sup> Some may argue that equation (1) is itself too naïve, as it does not allow for time varying expected returns. In our view, this argument is a red herring. Of course, equation (1) is predicated on the fact that we can derive an ex ante estimate of the cost-of-capital (risk adjusted) appropriate for a firm’s risk level. It would make no sense otherwise. However, irrespective of how a firm’s expected return varies over time, at any given point in time one should be able to provide a point estimate for its expected return (a constant equivalent discount rate for its expected cash flows) based on currently available information. Our point is that given *any* reasonable estimate of  $r$ , Price should not be viewed as equivalent to Value. We discuss related issues in more detail later. Specifically, in Section 1.7.2, we cover the evidence on the excessive volatility of market-wide stock prices. In Chapter 6, we revisit the issue of time-varying expected returns as an explanation for cross-sectional stock market anomalies.

there will indeed be no free lunch (“B”). However, the reverse does not follow – it is possible for prices to vary far from fundamental values without presenting any easy money (that is, although “A” implies “B”; “B” does not imply “A”).<sup>12</sup> The relevant point for capital market research is that just because returns are difficult to forecast, we should not jump to the conclusion that price is equal to intrinsic value. As we discuss below, much of the mess we find ourselves in today in empirical asset pricing comes from a failure to heed Shiller’s warning. But first, let’s revisit the root arguments for market efficiency.

#### 1.4 Why do we believe markets are efficient?

Why do we believe markets are efficient? The answer boils down to a visceral faith in the mechanism of arbitrage.<sup>13</sup> We believe markets are efficient because we believe arbitrage forces are constantly at work. If a particular piece of value-relevant information is not incorporated in price, there will be powerful economic incentives to uncover it, and to trade on it. As a result of these arbitrage forces, price will adjust until it fully reflects the information. Individual agents within the economy may behave irrationally, but we expect arbitrage forces to keep prices in line. Faith in the efficacy of this mechanism is a cornerstone of modern financial economics.

Moving from the mechanics of arbitrage to the efficient market hypothesis involves an enormous leap of faith. It is akin to believing that the ocean is flat, simply because we have observed the forces of gravity at work on a glass of water. No one questions the effect of gravity, or the fact that water is always seeking its own level. But it is a stretch to infer from this observation that oceans should look like millponds on a still summer night. If oceans were flat, how do we explain predictable patterns, such as tides and currents? How can we account for the existence

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<sup>12</sup> Consider the simple example where  $\text{Price} = \text{Value} + \varepsilon$ , and  $\varepsilon$  follows a random walk, or long term mean reverting process. If the investment horizon of the typical arbitrageur is longer than the time it takes for  $\varepsilon$  to make significant progress towards zero, then arbitrageurs will not be able to profit from the mispricing.

<sup>13</sup> Some finance textbooks define arbitrage as “the simultaneous purchase and sale of the same, or essentially similar, security in two different markets for advantageously different prices” (e.g., Sharpe and Alexander (1990)). This definition is too narrow for our purposes, because it implies an undertaking that requires no capital and entails no risk. In reality, almost all arbitrage requires capital, and is risky. Therefore, throughout this discourse, we will define arbitrage as information trading aimed at profiting from imperfections in the current price. Under this definition, arbitrage is based on costly information, and typically involves some risk.

of waves, and of surfers? More to the point, if we are in the business of training surfers, does it make sense to begin by assuming that waves, in theory, do not exist?

A more measured, and more descriptive, statement is that the ocean is constantly trying to become flat. In reality, market prices are buffeted by a continuous flow of information, or rumors and innuendos disguised as information. Individuals reacting to these signals, or pseudo-signals,<sup>14</sup> cannot fully calibrate the extent to which their own signal is already reflected in price. Prices move as they trade on the basis of their imperfect informational endowments. Eventually, through trial and error, the aggregation process is completed and prices adjust to fully reveal the impact of a particular signal. But by that time, many new signals have arrived, causing new turbulence. As a result, the ocean is in a constant state of restlessness. The market is in a continuous state of adjustment.

In this analogy, market efficiency is a journey, not a destination. Therefore, the pertinent questions about market efficiency are not yes or no, because strictly speaking the answer is always no. Price discovery is an on-going process and the current price of a security is best regarded as a noisy and incomplete proxy for a security's true fundamental value. In this context, the research focus should be on deriving an independent measure of fundamental value, and on understanding the dynamics of market price discovery. Rather than assume market efficiency, our research efforts are better focused on how, when, and why prices adjust (or fail to adjust) to information.

### 1.5 Can mispricing exist in equilibrium?

The descriptive validity of the above analogy depends on the continued existence of mispricings. Is it possible for mispricing to exist in equilibrium? Certainly. In fact, it strikes us as self-evident that arbitrage cannot exist in the absence of mispricing. Arbitrageurs are creatures of the very gap created by mispricing. Therefore, either both exist in equilibrium, or neither will. Arbitrage cannot take place without *some* amount of mispricing. If by some mystical force prices always adjust instantly to the right value, we would have no arbitrageurs. Therefore, if we

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<sup>14</sup> Pseudo signals have the appearance, but not the substance, of news. Trading on the basis of pseudo signals is one source noise trading, as described by Black (1986).

believe that arbitrage is an equilibrium phenomenon, we must necessarily believe that *some* amount of mispricing is also an equilibrium phenomenon.

It may be useful to frame this discussion in terms of Hayek (1945). Hayek addresses the vital role of markets in aggregating information across heterogeneously informed traders. The present discussion focuses on the incentives for information acquisition and arbitrage. We argue that sufficient incentives must exist to ensure that the price discovery process featured in Hayek (1945) operates effectively. In effect, the very reliability of prices depends on a sufficient level of mispricing to ensure arbitrage continues to function.

We do not disagree with the main thrust of Hayek's argument: that markets aggregate knowledge across diverse investors more efficiently than a central planner. But we can agree that the market knows better than the government, without claiming that the market price is always right. In fact, because sustained arbitrage depends on the continued existence of exploitable opportunities, a free and competitive market is almost necessarily inefficient to some degree. This is part of the price we pay for the benefits offered by the market mechanism.<sup>15</sup>

Much is made of the evolutionary argument that noise traders (naïve investors) cannot survive in a competitive market place.<sup>16</sup> To us, the best evidence in favor of the long-term viability of noise traders is the continued existence of active professional arbitrageurs. Ecologists coming upon the African Safari encountered large prides of lions. From the abundance of these predators, they inferred an abundance of gazelles, zebras, and other forms of lion prey. In the same spirit, the massive arbitrage apparatus we observe today attests powerfully to the continuing presence of substantial market imperfections. We cannot at once believe in the existence of lions, and reject the existence of the creatures that are essential to their survival.

Some believe that active asset managers are merely clever marketers, shysters who play no role in making markets more efficient (e.g., Rubinstein (2001)). But we would then be hard pressed

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<sup>15</sup> Shleifer (2000) makes this argument, and contains a good discussion of the origins of the efficient market hypothesis.

<sup>16</sup> See Friedman (1953) for the original argument. DeLong, Shleifer, Summers, and Waldmann (1990a) offers a defense for the survival of noise traders in equilibrium.

to explain the billions of dollars spent, year after year, in this futile pursuit. Index funds are not a new idea. Why should it take so long for investment money to flow to these funds? The same evolutionary forces that are used to argue for the extinction of noise traders, argue also for the extinction of active money managers. Both seem equally puzzling. Either our financial markets have a persistent need to be corrected every year, the magnitude of which runs into the billions of dollars, or the labor market for investment talent is absurdly inefficient.

The fact that active managers do not beat their benchmarks after management fees is often cited as evidence in favor of the efficiency of financial markets. But this evidence has little bearing on the market efficiency debate. The average performance of active managers tells us more about the state of labor markets than about the efficiency of financial markets. If active managers consistently under (over) perform their benchmarks after management fees, capital would flow to passive (active) investment instruments. In equilibrium, the fees they charge should equal the amount of mispricing they remove through their arbitrage activities. We should therefore expect the *after-fee* performance of active managers to approximately equal their benchmark.

How large is the market for active asset management? The answer is not straightforward. It needs to be estimated through multiple sources, and is dependent on fluctuating market prices. As of the end of 2012, a reasonable estimate of the total assets under management (AUM) controlled by professional managers is around 90 trillion USD.<sup>17</sup> Although not all of this AUM is actively managed, multiple sources indicate that the vast majority (at least 70%) resides with active, not passive, managers.<sup>18</sup> Assuming just a flat 1% active management fee (not counting performance fees), a conservative estimate of the first-order costs of informational arbitrage is over 600 billion USD per year. This is simply the management fee paid to active managers, who are part of a much larger ecosystem that also includes various other information intermediaries

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<sup>17</sup> Estimates of AUM vary depending on source. A Boston Consulting Group study (Shub et al. (2013)) estimate the conventional publicly traded assets managed professionally for fees (pension funds, insurance funds, and mutual funds) to be around US\$62.4 trillion at the end of 2012. The CityUK Fund Management Report (Hines (2012)) uses a broader AUM definition, and estimates conventional assets under management to be \$85.2 trillion at the end of 2012. This report also provides an estimate of alternative assets (managed by sovereign wealth funds, hedge funds, private equity funds, exchange traded funds, and wealthy individuals or family offices). Taken together, the CityUK report estimates total assets under global fund management to be \$120 trillion.

<sup>18</sup> See for example, Chart 23 in the Hines report, which details the breakdown between active versus passive management by industry sector in the UK.

(e.g., the prime brokers, sell-side analysts, financial consultants, providers of analytical software and trading platforms), as well as data vendors (e.g., Bloomberg, Thompson-Reuters, Factset, S&P Capital IQ). Clearly informational arbitrage is big business. Whatever you may think about market efficiency, one thing is certain – the current level of efficiency that we enjoy is the result of a costly price discovery apparatus.

It is difficult to understand how an industry of this size can survive unless, on average, the amount of mispricing extracted by these active managers is on the same order of magnitude. Even if *part* of what we pay for active managers is excessive, it's unlikely that *all* of this expenditure is non-productive. If a significant proportion of active asset managers earn their keep (i.e., match or beat their benchmark *after* expenses), their continued survival implies that equilibrium arbitrage costs are huge. We might argue about the speed and precision with which prices incorporate information, but we should not forget the price we pay to achieve it. That is the subject of the next subsection.

### 1.6 The limits of arbitrage

Once we view informational arbitrage as a technology, the focus shifts from a macro view of market equilibrium to a micro view of how and when we might recognize mispricings, and what it would take to exploit them. In recent years, a controversial new technology known as “fracking” has revolutionized the energy industry. By allowing trapped natural gas from shale formations to be extracted at much lower costs, fracking has changed the economics of global energy production. Like energy production, active management involves a technology, and all technologies are subject to continuous improvement. Thus a proper understanding of market efficiency can only come when we are willing to examine, and to challenge, the current state of technology for alpha extraction. This is the study of the limits of arbitrage.

Accounting researchers can contribute to this process by developing lower cost techniques for market arbitrage. For example, our research might lead to better techniques for spotting arbitrage opportunities, thus allowing prices to assimilate the information faster or in a more unbiased manner. Our work might also help to deliver the same level of arbitrage service at a

reduced cost. In either case, we improve the efficiency of financial markets by enhancing the cost-effectiveness of the arbitrage mechanism.

Our point is that to improve informational efficiency, we do not need to beat the market *before* active management fees. We can also contribute to the process by reducing the costs of arbitrage. A number of academic studies in accounting have had a substantial impact on the trading behavior of professional arbitrageurs.<sup>19</sup> Perhaps market prices are adjusting more quickly and in a more unbiased fashion as a result of this research. But even if this research has not resulted in more efficient prices, it has almost certainly reduced search costs for arbitrageurs.<sup>20</sup> In this sense, accounting research has directly contributed to the allocation efficiency of financial markets.

Less directly, our educational endeavors also help facilitate this process. Through our classroom efforts, we supply the market with a group of more informed investors. As the level of sophistication improves among market participants, prices also become more efficient. Traditionally, we have in mind the notion that prices are set by the mystical “marginal investor.” We do not know who this marginal investor is, but we presume she is quite sophisticated. Yet the evidence on noise trading (discussed in Chapters 2 and 4) suggests that relatively unsophisticated investors can also affect returns in market segments they dominate. If we regard price as a capital-weighted consensus of investor opinions, an improvement in the overall sophistication of the investing public results in better markets.

### 1.7 What is wrong with the traditional model?

A common assertion is that even if the EMH is not strictly true, it is sufficient to serve as a starting point for research purposes. Like Newtonian physics, it is more than good enough for everyday usage. Unfortunately, it has becoming increasingly more difficult to accommodate

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<sup>19</sup> For example, Bernard and Thomas (1989, 1990), Sloan (1996), Frankel and Lee (1989), Richardson et al. (2005), and Piotroski (2004). All these studies have been analyzed and used by quant funds, and indeed seem to be reflected in the trading patterns of short sellers – a particularly sophisticated segment of the investing populous (Drake et al. (2011)). See Richardson, Tuna, and Wysocki (201) for a survey of recent literature in accounting anomalies.

<sup>20</sup> As a testimony to the usefulness of academic research, today hedge funds routinely receive monthly reports from sell-side firms that scour academic sources and summarize key findings for the investment community. One such provider claims to read and filter over 500 studies per month (DBEQS Global (2014)).

what we know about the behavior of prices and returns within this traditional framework. In this subsection, we discuss some of the problems with assuming that price is always equal to fundamental value.

**1.7.1 Trading Volume.** One immediate problem is trading volume. If we assume price fully reflects all information about future dividends (i.e., if equilibrium price is fully revealing), the rational expectation literature suggests that we should have no trading in individual stocks (e.g., Grossman and Stiglitz (1980)). Black (1986, page 531) observes:

*A person with information or insights about individual firms will want to trade, but will realize that only another person with information or insights will take the other side of the trade. Taking the other side's information into account, is it still worth trading? From the point of view of someone who knows what both traders know, one side or the other must be making a mistake. If the one who is making a mistake declines to trade, there must be no trading on information. In other words, I do not believe it makes sense to create a model with information trading but no noise trading...*

On a typical day in 2013, over six billion shares exchange hands at the New York Stock Exchange (NYSE), the Nasdaq, and the NYSE MKT (formerly AMEX). The vast majority of this trading is in individual securities. This enormous appetite for trading individual securities is a challenge for the traditional model, in which price fully reflects information about future dividends.

**1.7.2 Volatility.** If volume is difficult to explain, volatility is even more problematic.<sup>21</sup> In the classical framework, it is impossible for events that have no information content about future fundamentals to affect prices. Yet empirically, we find that news about fundamentals explains

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<sup>21</sup> Using a variance bound test, Shiller (1981) examined the proposition that stock prices are too volatile and concluded in the affirmative. This study precipitated a debate over the correction needed for variance calculations when both dividends and stock prices follow highly persistent processes with unit roots (see Kleidon (1986) and Marsh and Merton (1986), Campbell and Shiller (1987, 1988a, 1988b)). In particular, Campbell and Shiller (1987) tested a form of the dividend discount model that modifies the variance calculation for the unit root case, and once again found excessive volatility. See Campbell (2014) for a good discussion of this topic.

only a fraction of the volatility in returns (e.g., see Roll (1986), Cutler, Poterba and Summers (1989), and Chen, Da, and Zhao (2013); for anecdotal evidence, witness the October 1987 crash or the daily volatility in internet stocks). In Cutler et al. (1989), for example, macro-economic news variables from past, present, and future periods (e.g., innovations in production, consumption, interest rates, etc.) collectively explain less than 50% of the annual variability in stock returns. The same message is echoed in many cross-sectional studies that attempt to explain stock returns with accounting-based fundamentals (e.g., Easton, Harris, and Ohlson (1992), Richardson, Sloan, and You (2012)).<sup>22</sup> Throughout this literature, we find stock prices seem to move for reasons that have little to do with fundamental news. The weight of this evidence behooves us to adopt a broader view of asset pricing, and to entertain the possibility that other forces are at work in shaping prices and returns.

**1.7.3 Return Predictability.** Third, the evidence on the predictability of stock returns is increasingly more difficult to reconcile with the efficient market framework.<sup>23</sup> With risk-averse investors, all tests of potential trading strategies are a joint test of an asset-pricing model. If the asset-pricing model is misspecified, it is always possible the abnormal returns are some form of compensation for yet another unknown risk factor. However, with many of the more recent pricing anomalies, the risk-based explanations are becoming less plausible because of the ancillary evidence associated with these findings.

We find particularly compelling the evidence that *healthier* and *safer* firms, as measured by various measures of risk or fundamentals, often earn higher subsequent returns. Firms with lower Beta, lower volatility, lower distress risk, lower leverage, and superior measures of profitability and growth, all earn higher returns (e.g., Dichev (1998), Piotroski (2000), Lakonishok, Shleifer, and Vishny (1994), and Asness, Frazzini, and Pedersen (2013)). If these firms are riskier, it is odd that they should consistently exhibit future operating and return

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<sup>22</sup> In Easton et al. (1992), fundamental accounting variables explain 15% and 5% of the cross-sectional returns for two- and one-year horizons, respectively. Even when using a 10-year window, the authors find the adjusted r-square between stock returns and accounting measures to be only 62%. In a more recent study, Richardson et al. (2012) include both firms' expected returns and as well as forward-looking fundamental news (using analyst forecasts of earnings), and find that collectively these variables explain less than 40% of the variance in annual stock returns.

<sup>23</sup> Much of this evidence has been discussed in prior survey work (e.g., see Fama (1991), Shleifer (2000), Kothari (2001), and Richardson, Tuna, and Wysocki (2010)).

characteristics that suggest the opposite. We discuss this evidence in more detail in Chapters 3 and 6.

The finding that a substantial portion of the abnormal returns is earned around subsequent earnings release dates is also extremely difficult to explain in a risk context.<sup>24</sup> Asset pricing models do not predict these short-window price moves. Finally, the so-called momentum studies, that document subsequent price drifts to various corporate news releases (including earnings surprises, dividend announcements, and stock splits), are particularly resilient to risk-based explanations.<sup>25</sup> The fact that these events predict subsequent earnings surprises and the direction of analyst earnings revisions suggests they are related to market misperceptions of earnings rather than risk (e.g., see La Porta (1996), Chan, Jegadeesh, and Lakonishok (1996), Richardson et al. (2010)).

It might be worthwhile to note the evolving nature of the evidence in this literature over time. Initially, much effort was focused on *documenting* apparent pricing anomalies (e.g., DeBondt and Thaler (1985, 1987)). More recent efforts have been focused on *explaining* these anomalies and testing various behavioral models (e.g., Arif and Lee (2014)), sometimes using experimental techniques (Libby, Bloomfield, and Nelson (2002)). We believe future studies along these lines will not merely document new anomalies, but will also help to explain them. The literature is still at an early stage of development, but what we know is sufficient to convince many that risk-based explanations are not enough.

**1.7.4 Cost-of-Capital.** Finally, one of the most elemental challenges to the efficient market paradigm is spawned by the cost of capital dilemma. Historically, asset-pricing models have been tested using average realized returns to proxy for expected returns. This practice is based on the assumption that market prices are unbiased in large samples. Yet even this weaker form of market efficiency has been questioned in recent times. As Elton (1999) observes in his presidential address to the American Finance Association, “(t)here are periods longer than 10

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<sup>24</sup> Bernard and Thomas (1990) was perhaps the first and best-known study to use this technique in distinguishing between risk and mispricing explanations. Richardson, Tuna, and Wysocki (2010) contains a good discussion.

<sup>25</sup> Ikenberry and Ramnath (2002) summarize the evidence on post-event drifts. Asness and Liew (2014) provide a good discussion of value and momentum strategies, as well as a practitioner’s take on the market efficiency debate.

years during which stock market realized returns are on average less than the risk-free rate (1973 to 1984). There are periods longer than 50 years in which risky long-term bonds on average underperform the risk free rate (1927 to 1981).”

In other words, historical realized returns do not appear to be an appropriate proxy for expected returns, even averaged over decades. Changing risk premiums and conditional asset pricing theories are likely to explain some time-series variations, but these explanations cannot account for risky assets earning persistently lower returns than the risk-free rate. Indeed, growing discontent with the noisy nature of average realized returns is the main impetus for the move toward valuation-based techniques for estimating expected returns (e.g., Claus and Thomas (2000), Gebhardt, Lee and Swaminathan (2001), or Fama and French (2002)). Once again, we find that the “price equals value” assumption fails the Newtonian test of practical usage.

### Summary

The main point we wish to convey in this chapter that, as researchers, we need to think about fundamental value and the current market price as two distinct measures. This is because the problems engendered by the naïve view of market efficiency expressed in equation (1) are simply too pervasive to ignore. In fact, we believe the unshackling of price from value is a key conceptual step towards a better understanding of many long-standing puzzles in empirical financial economics, including: excessive trading volume, excessive return volatility, the pervasive evidence on returns predictability, the cost of capital dilemma, and the continued existence of a large active asset management industry.

We have argued that, at each point in the information aggregation process, Price is informed by, but not confined to equal, Value. In fact, the possibility of mispricing is what gives market participants the incentive to uncover news about firm value. We believe this is an extremely important concept to get across to researchers working in the capital market area. Indeed, we view it as *the* “watershed” shift in thinking needed to bridge academic researchers with most asset managers. Rather than *assuming* market efficiency, we should study how, when, and why price becomes efficient (and why at other times it fails to do so). Rather than *ignoring* the current market price, we should seek to improve it.

In the next chapter, we discuss an alternative framework that relaxes the assumption that price must equal fundamental value, based on Shiller (1984). We find this model compelling because it explicitly recognizes that information processing costs are non-trivial. In the model, Price is a function of both Value and Investor Sentiment, and prices can deviate widely from value without making anyone rich.

As we discuss in more detail later, this model foreshadowed two major lines of research in behavioral finance: (1) investor sentiment, and (2) limits to arbitrage. For accounting academics, we believe it also provides a sound pedagogical starting point for teaching fundamental analysis.

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## Chapter 2

### Rational Behavioral Models

In this chapter, we examine in some detail a simple noise trader model from Shiller (1984) that has been central to the development of the field of behavioral finance. We show how this model can serve as a helpful conceptual framework for integrating the three key elements in the formation of security prices: (1) firm fundamentals, (2) investor sentiment, and (3) arbitrage costs. We then use this framework to present a brief survey of the noise trader literature and discuss its relation to the literature on fundamental analysis in accounting, as well as on the predictability of cross-sectional returns. Finally, we discuss the implications of this model for market-based research, in both accounting and finance.

#### **2.1 Overview**

In his spirited defense of market efficiency, Rubinstein (2001) makes reference to what he calls *The Prime Directive* for financial economists:

*Explain asset prices by rational models. Only if all attempts fail, resort to irrational investor behavior. [page 16; emphasis ours]*

Rubinstein complains that the “burgeoning behavioralist literature...has lost all the constraints of this directive – that whatever anomalies are discovered, illusory or not, behavioralists will come up with an explanation grounded in systematic irrational investor behavior.” (page 4) This is an often-heard complaint against the behavioral camp. But it is an unfair complaint, because behavioral models do not need to violate this prime directive. Most models in behavioral finance now characterize the interplay between investor behavior and arbitrage costs in the determination of market prices and are thus based on economic principles of rational arbitrage. We therefore refer to them as rational behavioral models.<sup>26</sup>

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<sup>26</sup> We have in mind such theoretical studies as: Barberis, Shleifer, and Vishny (1997), Hong and Stein (1999), Daniel, Hirshleifer, and Subrahmanyam (1998, 2001), Barberis and Huang (2001), and Barberis, Huang, and Santos (2001). Earlier works along these lines include Shiller (1984), and DeLong, Shleifer, Summers, and Waldmann

Our goal in this chapter is to allay the suspicion that one must obtain a frontal lobotomy to embrace behavioral finance. For illustration, we will discuss a simple model from Shiller (1984). In many respects, this model is overly simplified and restrictive, and it has been supplanted in the literature by more sophisticated models. However, it provides an extremely useful framework for understanding the spirit behind the noise trader approach to understanding market dynamics. As we argue, the noise trader model (NTM) provides a useful alternative to the EMH in terms of its modeling of the interaction between fundamental investors, noise traders, and arbitrage costs.

### 2.1 Who are noise traders?

A distinguishing feature of rational behavioral models is that they feature noise traders. Fischer Black's influential Presidential address to the American Finance Association contains the following definition of noise traders (Black, 1986, page 531):

*Noise trading is trading on noise as if it were information. People who trade on noise are willing to trade even though from an objective point of view they would be better off not trading. Perhaps they think the noise they are trading on is information. Or perhaps they just like to trade.*

In short, we are a noise trader whenever we act on a signal that ultimately proves to be value-irrelevant. Under this definition, the existence of noise traders is as intuitive as it is innocuous. With continuous information flows, it is improbable that all traders can instantaneously calibrate the quality of their own signals. In this world, informed investors making ex ante rational trades may nevertheless lose money ex post on any given trade. Even if these investors are right more often than they are wrong, they are frequently engaged in noise trading. The existence of noise traders is therefore not inconsistent with the prime directive. In fact, noise trading is a necessary part of the price discovery process.

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(1990a, 1990b). See Barberis and Thaler (2000), Hirshleifer (2001), Baker and Wurgler (2007), and Barberis (2013) for good summaries.

As Black (1986) observes, noise trading is the “missing ingredient” in the traditional model. Noise trading helps to explain the enormous volume of trading we observe daily. Noise trading is the driving force behind much of the volatility in realized returns. Noise trading explains the continued existence of arbitrage. Finally, noise trading, in concert with the costly nature of arbitrage, helps to explain why prices can deviate sharply, and for persistent periods of time, away from fundamental value.

### 2.2 A Simple Example

The model in Shiller (1984) features two types of agents: “smart-money” investors and noise traders (whom Shiller refers to as “ordinary investors”). Smart-money investors trade on the basis of fundamental information, subject to wealth constraints. These investors respond to news about fundamental value quickly and in an unbiased manner. Noise traders, on the other hand, include everyone who does not trade on the basis of an optimal response to news about fundamentals. Notationally, the demands of these two types of traders can be expressed as follows:

#### Noise Traders (Ordinary Investors)

These investors have time-varying demands, not based on expected returns optimally forecasted. Their demand is denoted:  $Y_t$  = total value of the stock (per share) demanded by ordinary investors.

#### Information Traders (Smart money)

The demand for shares by smart money at time  $t$ , expressed as a portion of total shares outstanding ( $Q_t$ ), is:  $Q_t = (E_t(R_t) - \rho) / \phi$ , where  $R_t$  is the real rate of return on the stock at time  $t$ ,  $\rho$  = the expected real return such that there is no demand for shares by smart money, and  $\phi$  = the risk premium (i.e., the level of expected compensation) that would induce smart money to hold all the shares.

In equilibrium, the market clears when total shares demanded equals total supplied (i.e., when  $Q_t + Y_t/P_t = I$ ). Solving for the resulting rational expectation equilibrium yields the following market-clearing price:

$$P_t = \sum_{k=0}^{\infty} \frac{E_t(D_{t+k}) + \phi E_t(Y_{t+k})}{(1 + \rho + \phi)^{k+1}} \quad (1)$$

Expressed in this form, the market price is the present value, discounted at rate  $(1 + \rho + \phi)$ , of the expected future dividend payments at time  $t$  (i.e.,  $E_t(D_{t+k})$ ), plus  $\phi$  times the expected future demand by noise traders ( $E_t(Y_{t+k})$ ). In other words,  $P_t$  is jointly determined by a firm's fundamental value (future dividends) and a more capricious factor (future noise trader demand).

The relative importance of the two factors is determined by  $\phi$ . Recall that  $\phi$  is the risk premium that would induce the smart money to hold all the shares. It can be reasonably interpreted as a measure of the cost of arbitrage because smaller values of  $\phi$  result in greater demands from smart money to trade against expected mispricing (i.e.,  $E_t(R_t) - \rho$ ).

Notice that as  $\phi$  approaches zero, price in equation (1) becomes a function of expected dividends, and the efficient market model emerges as a special case:

$$P_t = \sum_{k=0}^{\infty} \frac{E_t(D_{t+k})}{(1 + \rho)^{k+1}} \quad (2)$$

In other words, in markets where costs of arbitrage are low, prices behave much as predicted by the efficient market hypothesis. However, as  $\phi$  increases, so does the relative importance of noise trading. In the extreme, as  $\phi$  approaches infinity, market price is determined solely by noise trader demand, and fundamental valuation plays a trivial role in setting prices.

What factors affect  $\phi$ ? Clearly characteristics of smart-money investors, such as their risk aversion and wealth constraint, are important. More generally, arbitrage costs involve: 1) *trading costs*: costs associated with establishing and closing the position; including brokerage fees, price slippage, bid-ask spreads etc., 2) *holding costs*: costs associated with sustaining a position; these costs are affected by factors such as the duration of the arbitrage position and the incremental cost of short-selling a stock, and 3) *information costs*: costs associated with information acquisition, analysis, and monitoring.<sup>27</sup>

Markets in which these three types of costs are low feature prices close to fundamentals. For example, the markets for index futures and closed-end funds are characterized by relatively low transaction and information costs. In these markets, valuation is relatively straightforward, transaction costs are minimal, and the traded assets often have close substitutes. As might be expected, the prices for these assets are closely tied to their fundamental values.<sup>28</sup>

In other markets, however, arbitrage costs ( $\phi$ ) can be potentially large, so noise traders dominate. For example, the capital markets of many emerging economies feature relatively few fundamental investors, little market depth and therefore high arbitrage costs. In domestic markets, smaller firms, less closely followed and less actively traded stocks, and growth stocks that are difficult to value will likely have higher arbitrage costs. The noise trader model predicts that security prices in these markets will display more volatility, and will often seem to bear little relation to their fundamental values.<sup>29</sup>

The main message from this model is that market prices are a product of the interplay between noise traders and rational arbitrageurs, operating under cost constraints. Once we introduce

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<sup>27</sup> Shleifer and Vishny (1997) model the limits of arbitrage. We devote chapter 5 to this topic.

<sup>28</sup> Even so, the evidence on closed-end fund discounts suggests that  $Y_1$  exists and is mean-reverting (e.g., see Lee, Shleifer, and Thaler (1991)).

<sup>29</sup> Subsequent work by Baker and Wurgler (2006) provide strong support for this aspect of the Shiller model. Specifically, Baker and Wurgler show that, in the cross-section, a firm's sensitivity to a measure of market-wide sentiment (i.e., its "Sentiment Beta") is indeed a function of arbitrage costs (measured by its idiosyncratic volatility).

noise traders and costly arbitrage, price is no longer simply a function of future expected dividends. Unless arbitrage costs are zero,  $P_t$  will not generally equal  $V_t$ . The magnitude of the mispricing is a function of noise trader demand and arbitrage costs. More generally, when arbitrage costs are non-zero, we can expect some mispricing to be an equilibrium phenomenon.

Another key insight is that the unpredictability of returns (a “no free lunch” version of the efficient market hypothesis) does not guarantee price equals value (a “the price is right” version of the efficient market hypothesis). Unfortunately, when the efficient market hypothesis is invoked, it is often in the latter form. The fact that returns are largely unpredictable has been widely interpreted as evidence in support of the fact that price equals the present value of expected dividends. However, the model illustrates a conceptual problem with this general approach to testing for market efficiency. In the model, returns may be unpredictable but stock prices can still diverge dramatically from fundamental values.<sup>30</sup>

Finally, the model highlights the difference between fundamental analysis and security analysis. Fundamental analysis is concerned with measuring firm value regardless of market conditions. But in making security selections, smart-money investors need to consider the behavior of noise traders, as well as fundamental valuation, in determining their own strategy. Smart money investors need to consider “fashions” and “fads” in addition to “fundamentals.” Moreover, the time-series behavior of  $Y_t$  becomes important. If noise trader demand is random, then  $P_t$  is still the best forecast of  $V_t$ . However, if  $Y_t$  is mean reverting, then fundamental analysis is potentially profitable. We expand on this point in the next chapter.

### 2.3 The Noise Trader Approach to Finance

It has now been three decades since Shiller published his model. In the ensuing years, behavioral finance has continued to grow and expand as a subfield of economics. Interestingly, the key

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<sup>30</sup> For example, if arbitrage is costly (i.e.,  $\phi > 0$ ) and noise trader demand ( $Y_t$ ) follows a random walk, the second term in the numerator can be large, but stock returns are unpredictable. More generally, if  $Y_t$  exhibits long-horizon mean-reversion, rational traders with finite horizons would not be able to exploit the mispricing, even if it is currently large.

features of this model have endured, and continue to be a useful organizing framework for much of the subsequent work. Today, work on the “noise trader approach to finance” (Shleifer and Summers (1990)) continues along three lines: (1) Firm fundamentals (or equity valuation), (2) Investor sentiment (or non-fundamental price pressures), and (3) Limits to arbitrage. We will take a closer look at each of the three components of the model in the next three chapters: Chapter 3 (Equity Valuation), Chapter 4 (Investor Sentiment) and Chapter 5 (Limits to Arbitrage). In the meantime, we present an extremely condensed synopsis of the three strands of research.

### *2.3.1 Equity Valuation*

A large literature examines the measurement of firm value based on fundamental analysis. Much of the innovation has taken place in accounting in recent years, where the re-emergence of the residual income model (RIM) has been central in pushing the research agenda.<sup>31</sup> Although this line of inquiry is not typically associated with behavioral finance, it fits well within the Shiller framework. In the context of a noisy market price, an independent assessment of firm value based on sustainable expected cash flows becomes central. Indeed, unless and until we have a sensible measure of the value of firms based on expected payoffs to shareholders, it is difficult to empirically distinguish between the two terms in the numerator of equation (1).

In Chapter 3 of this volume, we provide a review of some key insights gleaned from accounting-based valuation theory. Our analysis demonstrates the inextricable conceptual link between a stock’s “cheapness” (what the finance literature refers to as “the value effect”, typically measured using various market multiples), and its “quality” (what the accounting fraternity sometimes refers to as “fundamental pricing anomalies”, but which we believe are simply accounting-based indicators of firm’s expected growth opportunities).

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<sup>31</sup> RIM had its origin in the early work of financial economists (e.g., Preinreich (1938), Edwards and Bell (1961), Peasnell (1982), and Lehman (1993)). In the mid-1990s, a series of influential studies by James Ohlson (Ohlson (1990, 1991, 1995), Feltham and Ohlson(1995)) helped accounting researchers to focus sharply on the importance of the model as a means to understanding the relation between accounting data and firm value. Another key contributor to this research has been Columbia professor Stephen Penman (see Penman (1997, 2010, and 2012)).

A key prediction of Shiller's model is that, if arbitrage costs are non-trivial, sharper measures of firm value will yield superior predictive power for future returns. As we show in Chapter 3, an enormous body of evidence now suggests this is indeed the case.

### 2.3.2 *Investor Sentiment*

Broadly defined, investor sentiment refers to “optimism” (or “pessimism”) not justified by existing fundamentals. Shiller envisioned traders who overreact/underreact to news, or are vulnerable to fads and fashion trends, and much of his original article was devoted to a discussion of noise trading as a social phenomenon. However, because the source of noise is exogenous, what qualifies as investor sentiment in the model is in fact quite broad, and includes for example the actions of those who trade for liquidity or consumption-based reasons. A distinguishing feature of investor sentiment is that it is coordinated (or systemic) investor demand of a non-fundamental nature, and thus the price pressure it generates will cause price to move away from fundamental value.<sup>32</sup>

Subsequent empirical studies have used various techniques to measure market-wide sentiment. Examples included the discount on closed-end funds (Lee, Shleifer, and Thaler (1991)), the proportion of equity vs. debt issues by corporations (Baker and Wurgler (2000)), the consumer confidence index (Lemmon and Portniaguina (2006)), the monthly fund flow between equity and bond mutual funds within the same family (Ben-Raphael et al. (2012)), and a bottom-up measure of aggregate corporate investment (Arif and Lee (2014)), and a composite sentiment index (Baker and Wurgler (2006); Baker, Wurgler, and Yuan (2012)). See Baker and Wurgler (2007) for a good summary.

Although investor sentiment is often viewed as a market-wide phenomenon, the concept of non-fundamental price pressure is also highly relevant to the relative pricing of individual securities, industries (e.g., e-commerce or biotech), geographical regions, or investment “styles” (e.g., value versus growth, or low-volatility versus high-volatility). When certain stocks, industries, regions,

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<sup>32</sup> Unless noise trading is positively correlated across traders, or systemic, it will not affect price. Empirically, trading records from individual brokerage accounts suggest noise trading is indeed systemic (e.g., Kumar and Lee (2005)).

or styles of investing becomes “hot”, money flows in that direction, resulting in initial price escalations, followed by subsequent return reversals. For example, an interesting line of research examines the net inflows of money into various mutual funds, and documents how these flows then impact future returns and the corporate actions of stocks held by the mutual funds (e.g., Coval and Stafford (2007), Frazzini and Lamont (2008), Lou (2012), Khan, Kogan, and Serafeim (2012)).

More broadly, the literature on investor sentiment has examined the effect of signal saliency and statistical reliability on the proclivity of investors to over- and under-weight individual signals. Following the lead of psychologists (e.g., Kahneman and Tversky (1974), Griffin and Tversky (1992)), researchers have observed a broad tendency for investors to over-weight signals that are more salient or attention grabbing (e.g., Barber and Odean (2008), Hirshleifer, Lim, and Teoh (2009), Da, Engelberg, and Gao (2011), and Engelberg, Sasseville, and Williams (2012)), and under-weight signals that are statistically reliable but less salient, or required more processing to be understood (e.g., Della Vigna and Pollet (2007), Gleason and Lee (2003), Giglio and Shue (2012), Cohen and Lou (2012), Cohen, Diether, and Malloy (2013)).

In sum, the literature on investor sentiment is vast. We will touch on it again when discussing value investing (Chapter 3) and will covered it in far more detail in Chapter 4. At this point, our main message to accounting researchers is that stock prices can move for many reasons other than a change in the present value of its expected future cash flows. These movements can be large and persistent without being exploitable. Yet far from reducing the relevance of fundamental analysis, this observation about markets actually elevates its importance.

### *2.3.3 Limits to arbitrage*

The third element in the Shiller model is arbitrage costs (represented by  $\phi$ ). In equilibrium rational investors are compensated not only for bearing fundamental risk, but also for costs and risks associated with noise trading. Subsequent analytical studies have provided more structure by modelling various aspects of the costs faced by informational arbitrageurs, including: agency problems raising from delegated asset management (Shleifer and Vishny (1997)), noise trader

risk (DeLong et al. (1990a, 1990b)), and a coordination problem faced by even sophisticated investors (Stein (2009)).

More broadly, arbitrage costs encompass all costs and risks related to the exploitation of price deviations from fundamental value. Once again, the idea of arbitrage costs is applicable at the market level, the industry level, the style level, or the individual security level. At the individual security level, Baker and Wurgler (2006) operationalize this concept using firm-level idiosyncratic volatility as an empirical proxy. Many other studies have documented a relationship between arbitrage constraints the magnitude of security mispricings (e.g., Pontiff (1996), Mendenhall (2004), Mashruwala, Rajgopal and Shevlin (2006)). The role of short selling has received particular attention (e.g., Blocher et al. (2013), Beneish et al. (2013), Hirshleifer, Teoh, and Yu (2011)).

Increasingly, we find evidence that market frictions can have a dramatic effect on the pricing of assets. For example, even in extremely liquid markets, such as monthly Treasury auctions, dealers' limited risk-bearing capacity and end-investors' imperfect capital mobility can impact prices and cause predictable patterns in future returns (Lou, Yan, and Zhang (2013)). The influence of market frictions on prices is also highly time varying. For example, So and Wang (2014) provide evidence that short-term return reversals in equity markets, a proxy for the expected return market makers demand for providing liquidity, increase over six-fold immediately prior to earnings announcements due to increased inventory risks associated with holding net positions through the release of anticipated earnings news. At the same time, the ability of market participants to assimilate news seems to be affected by their limited attention span and processing power (Hirshleifer and Teoh (2003) and Hirshleifer et al. (2009)).

#### 2.4 Implications for market-based research

We have argued that decoupling fundamental value from price is an important conceptual step toward a richer research agenda. But, if price is not always equal to value, what role should market prices play in our research design? How do we evaluate alternative estimates of value if price is a noisy proxy for fundamental value? What specific areas of research appear particularly promising at the moment? We turn now to these issues.

### 2.4.1 *Suggestions for Future Research*

What type of research will have the greatest impact in the future? Rather than generating a laundry list, we will try to outline several features of salient research. Broadly speaking, we believe the salient research in this area will be: 1) decision-driven, 2) interdisciplinary in nature, and 3) prospective in focus.

***Decision-driven.*** Many young researchers begin their quest for a research topic by reading recent issues of academic journals. Given the lead time to publication at most of our top academic outlets, these journals are not necessarily the best starting point for new research projects. An alternative, and complementary, approach is to begin by identifying significant economic decisions that utilize accounting data. In terms of generating ideas, practitioner journals can be a good place to begin. The aim is to acquire an independent perspective on topics that matter, in a broader economic context, *before* getting too close to the academic literature itself.

Decision-driven research is not to be confused with product development or consulting. We are not suggesting that we direct our research to practitioners. Rather, our call is for more research that is based on careful observation of how decision makers behave, and how information signals are used (or misused). Even basic research aimed at the theoretical foundations of our discipline will benefit from more detailed knowledge of how important economic decisions are made.

Excellent examples of this type of research come from the literature on fundamental analysis. In these studies, accounting-based variables are used to predict a variety of future outcomes. For example, financial statement variables have been used to predict financial distress (Altman (1968)) and future earning changes (Ou and Penman (1989)). They have proved useful in assessing the persistence of earnings (Sloan (1996), Richardson et al. (2005)), improvements in fundamentals (Piotroski (2000), Piotroski and So (2012)), and the probability of earnings manipulation (Beneish (1999), Beneish et al. (2013)). Often, these variables also possess predictive power for subsequent stock returns (see Richardson et al. (2010) for a good summary).

***Interdisciplinary in nature.*** Few capital allocation decisions of significance involve solely the use of accounting information. Therefore, it should not be surprising that the most important accounting research in the capital market area will be interdisciplinary in nature. Solid training in finance and economics is essential in these undertakings.

Some of the most interesting topics open to accountants today have traditionally been regarded as the domain of corporate finance, asset pricing, or behavioral finance, even though accounting information plays an important role in these decision contexts. In our view, accounting researchers are likely to be better qualified to address many issues that arise in equity valuation, share repurchases, LBOs, IPOs, loan syndications, mergers and acquisitions, and stock selection, than their counterparts in finance. If we are willing to tackle these issues, accounting researchers have the opportunity to generate some of the most significant research in financial economics over the next few decades.

In addition, we believe it is now important for accounting researchers to be familiar with the behavioral finance literature. Thaler (1999) predicts the demise of behavioral finance as a separate branch of finance because he believes that, in the future, all of finance will be behavioral. We are not at that stage yet, but the trend is unmistakably in this direction. In 2012, the *Journal of Financial Economics* had a special issue on the topic of Investor Sentiment, something unthinkable only a few decades ago.

We believe accountants also have an important role to play in understanding noise trader demand. Unlike Keynes' animal spirits, Shiller's noise traders are not driven primarily by idiosyncratic impulses or "a spontaneous urge to action" (Keynes (1936, page161)). Instead, the mistakes in investor expectations are correlated across traders. Thus, Shiller does not model individual irrationality so much as mass psychology or clientele effects. A common preference or belief, which we might call investor sentiment, affects large groups of investors at the same time.

What gives rise to these common sentiments (i.e., what affects  $Y_t$ )? Shiller suggests sentiments arise when investors trade on pseudo-signals, such as price and volume patterns, popular models,

or the forecasts of Wall Street gurus. More generally,  $Y_t$  captures any price effect other than those arising from the optimal use of dividend-related information. In this sense, noise trader demand can be due either to sub-optimal use of available information, over- and under-reactions to legitimate information signals, or responses to other exogenous liquidity shocks.<sup>33</sup>

The most salient feature of noise trader demand is that it drives price away from a stock's fundamental value. Therefore, as we refine our valuation tools, we simultaneously generate better metrics for measuring noise trader demand. As information economists, accountants can help identify signals (or pseudo-signals) that affect noise trader demand. We can also shed light on the nature and extent of information processing costs (e.g., Demers and Vega (2011), Engelberg (2008)), and how these costs impact corporate disclosure decisions (Blankespoor (2013)). In fact, prior studies in accounting that investigate the under-utilization of information in financial reports (e.g., Sloan (1996), and Richardson et al. (2005)) can be viewed as efforts to identify noise trader preferences. Once we recognize that we can all be noise traders (that noise traders are not a breed apart), the reconciliation with current accounting research is not difficult.

***Prospective in focus.*** Much of accounting is historical in nature. A good deal of our research in the capital market area has also tended to be retrospective and conducted within a framework where stock return (or price) appears as the dependent variable and contemporaneous accounting data appear as independent variables. According to this widely utilized paradigm, accounting data that better explain contemporaneous returns (or prices) are presumed to be superior in some normative sense.

However, as pointed out by Bernard (1995; page 743), this paradigm is limiting because it "precludes *from the outset* the possibility that researchers could ever discover something that was not already known by the market." As our view on market efficiency changes, we believe a greater emphasis will be placed on research that helps predict the outcome of *future* economic events. This research will have as a primary focus the goal of enhancing capital allocation

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<sup>33</sup> In the noisy rational expectation literature, the noise introduced by exogenous liquidity shocks is crucial in inducing trading and in limiting the extent to which price reveals full information. For an example of this type of model, see Grossman and Stiglitz (1980) or Diamond and Verrecchia (1981).

decisions whose outcomes are not yet known. It will include, but not be limited to, studies that help to forecast future stock returns.

Each year the American Accounting Association (AAA) awards a Notable Contributions to Accounting Literature Award. The recipient(s) of this award have written, in the view of the selection committee, the most influential study in accounting over the past five years. The subject matters covered by the past winners are diverse, and include: earnings quality, cost-of-capital, equity valuation, financial statement analysis, managerial accounting, auditor judgment, international accounting standards, and corporate governance.<sup>34</sup> But even a cursory review of these winners will make plain the importance of focusing on decision-relevant and interdisciplinary research of a prospective nature.

### *2.5 Research Design Issues*

If the stock price itself is a noisy measure for a firm's true fundamental value, how should we proceed in designing our research studies? How do we model the relation between value and price? This is a matter of obvious import as we leave the comfortable confines of the efficient market paradigm. Future researchers will need to grapple with this matter more thoroughly, but the following two empirical studies might serve to illustrate the possibilities. Both are what we regard as "hybrid" studies that do not discard the information in market price completely, but rely on weaker assumptions about the relation between price and fundamental value.

First, Lee, Myers and Swaminathan (1999) (LMS) models price and value as a co-integrated system -- in other words, the observed price and the accountant's estimate of value both measure the true (but unobservable) fundamental value with noise. In this context, they examine the question of how value estimates based on accounting numbers should be evaluated. They show that in this framework, under fairly general conditions, superior value estimates will not only be more correlated with contemporaneous returns, but will also yield better predictions of future returns.

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<sup>34</sup> See <http://aaahq.org/awards/awrd3win.htm>

In the LMS model, prices and value are assumed to be long-term convergent due to arbitrage forces. However, in the spirit of the noise trader model discussed in the prior section, at any given point in time market price can diverge from the true (but unobserved) fundamental value. In this context, the role of fundamental analysis is to generate an independent value estimate that helps to discipline the observed price. Their analysis suggests two benchmarks for evaluating the degree to which an accountant's empirical value estimate has been successful in capturing true fundamental value. Specifically, LMS argues that superior measures of true intrinsic value will be better able to: (a) track price variation over time, and (b) predict of future returns. Using these two performance metrics, they provide evidence on the usefulness of various inputs into the RIM model – such as analyst forecasts, time-varying discount rates, etc.

Second, Gebhardt, Lee, and Swaminathan (2000) (GLS) use a discounted residual income model to generate a market implied cost-of-capital. They then examine firm characteristics that are systematically related to this cost-of-capital estimate. They show that a firm's implied cost-of-capital is a function of its industry membership, B/M ratio, forecasted long-term growth rate, and the dispersion in analyst earnings forecasts. Together, these variables explain around 60% of the cross-sectional variation in future (two-year-ahead) implied costs-of-capital. The stability of these long-term relations suggests they can be exploited to estimate future costs-of-capital.<sup>35</sup>

Contrary to the concerns raised in Kothari (2001), the research design in GLS is not based on an assumption of market efficiency in the traditional sense (i.e.,  $P_t = V_t \forall t$ ). For purposes of stock selection, it would be tautological to estimate the implied cost-of-capital based on current stock prices. In fact, the cost-of-capital estimate recommended in GLS does not rely on a firm's current market price. Rather, GLS relies on long-term relations between the market implied cost-of-capital and various firm characteristics to estimate an “expected” or “warranted” cost-of-capital for each firm. This warranted cost-of-capital is then compared to the “actual implied”

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<sup>35</sup> An important caveat is that a substantial part of this explanatory power derives from the fact that the implied cost-of-capital is correlated with firm characteristics, such as the B/M ratio.

cost-of-capital derived from the current price. Trading strategies are based on the “spread” between the warranted and actual measures.<sup>36</sup>

Both studies implicitly assume a weaker form of market efficiency than is commonly found in the literature. Specifically, these studies assume that price and value are locked together in the long run by arbitrage forces. Price contains valuable information about future payoffs that should not be ignored. However, at any given point in time, price also departs from fundamental value due to exogenous forces (or, in the parlance of behavioral finance, noise trader demand).

The authors in these studies exploit the long-term relation between accounting fundamentals and market prices to gauge short-term price deviations. We refer to this as a “hybrid” approach, because it utilizes both accounting fundamentals and past prices to predict future prices. Returning to the ocean analogy, these studies use the *average* level of the ocean (i.e., the long-term market valuation of certain fundamentals) to measure the *current* height of the tides (the current market valuation of the same fundamentals).

## 2.6 Summary

The existence of Noise Traders is a centerpiece of the noise trader model (NTM). In simple terms, investor sentiment (or noise trader demand) may be defined as any investor demand or price pressure not aligned with news about fundamentals. In the NTM, investor sentiment can cause prices to move away from fundamental value. Investor sentiment could be driven either by differential liquidity needs, preferences, or information sets; or alternatively by behaviorally induced biases in the assessment of currently available information.

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<sup>36</sup> This approach is analogous to fixed income arbitrageurs who routinely compare the warranted yield on bonds to the actual yield at a given point in time to uncover profit opportunities. Bhojraj and Lee (2002) demonstrate how warranted multiples can help identify peer firms. In practice, many quantitative asset managers already implicitly make such an adjustment when they neutralize their value signals to industry, size, and other firm characteristics that consistently explain firms’ implied cost of capital.

Although the idea that noise traders can affect prices is often identified with the behavioral finance literature, it is not unique to this literature. Noise traders were an integral part of the noisy rational expectation models and the Kyle (1985) models in market microstructure. In these models, noise traders trade for exogenous liquidity reasons. What is unique about the behavioral models is that these traders are assumed to trade not only for liquidity reasons, but also because they also tend to misperceive the present value of firms' future fundamentals.

In the NTM, the demand of noise traders affects prices in at least three important ways. First, the synchronized activities of noise traders is the reason prices deviate away from fundamentals, thus their collective actions are the primary source of the market mispricing in equilibrium. At the same time, as Black (1986) observed, it is noise trader demand that provides the opportunity for smart money to earn a higher return by investing in information acquisition and analysis. Therefore, while noise traders *cause* mispricing, they are also the ultimate source of funding for the arbitrageurs (smart money).

Second, noise trading is a key source of market risk, which is priced in equilibrium. The fact that the actions of these noise traders are difficult to predict introduces an additional element of risk to all market participants. This is seen as the risk premium associated with arbitrage costs (the  $\phi$  parameter), which appears in the denominator of the market clearing price. Finally, the severity of the effect of noise trading is also related to the cost of arbitrage. Specifically, the magnitude of the mispricing is a function of how costly it is for smart money to eliminate the activities of the noise traders.<sup>37</sup>

This noise trader demand might come from exogenous liquidity shocks that are non-fundamental in origin. In the ensuing years, an extensive literature on investor sentiment and noise trading has emerged, with implications for empirical asset pricing, corporate finance, financial accounting, and macroeconomics. More complex and sophisticated models have been developed that attempt to provide more structure on the dynamics of noise trading and under various forms of

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<sup>37</sup> For simplicity, the model assumes noise trader demand is exogenous. In reality, the nature and extent of expected noise trader demand (the  $E_t(Y_{t+i})$  term) is unlikely to be independent from the size of the risk premium smart money demands for holding the risky asset (the  $\phi$  term).

constrained arbitrage.<sup>38</sup> However, simple as it may seem, the basic framework outline in Shiller's 1984 study has survived largely intact in literature today.

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<sup>38</sup> For example, DeLong et al. (1990a, 1990b), Barberis, Shleifer, and Vishny (1998), Hong and Stein (1999), and Daniel, Hirshleifer, and Subrahmanyam (2001).

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## Chapter 3

### Equity Valuation

This chapter offers an introduction to equity valuation with the goal of building a bridge between the theory and practice of value investing. We review some key insights gleaned from accounting-based valuation theory to demonstrate the inextricable conceptual link between a stock's "cheapness" and its "quality". We then use these insights as an organizing framework to discuss the essence of intelligent value investing.

We also discuss the implications of accounting-based valuation theory for market efficiency. Using examples from the asset management industry, we illustrate the key role played by equity valuation in informing investment decisions. At the same time, we show how seemingly disparate strands of empirical evidence in academic studies about the predictive power of historical accounting variables for stock returns, in fact, dovetail nicely with the investment philosophy of such legendary investors as Ben Graham, Warren Buffett, and Joel Greenblatt.

Finally, the chapter ends with a discussion of whether value investing will continue to be profitable in the future. In doing so, we survey potential explanations for the long-standing success of value investing discussed in the academic literature.

#### **3.1 Overview**

Value investing refers to the buying or selling of stocks on the basis of a perceived gap between a firm's market price and its intrinsic value. What is the intrinsic value of a firm? Here is a simple and relatively non-controversial definition.

***“The intrinsic (equity) value of a firm is the present value of expected future payoffs to shareholders.”***

Unlike rare art, stocks are commonly presumed to have an intrinsic value. The intrinsic value of a Van Gogh painting is ill defined; basically, its value is what people are willing to pay for it. But when investors think about equity valuation, we have in mind a monetary sum that

corresponds to the present value of expected future payoffs to shareholders. Each share, after all, is simply a fractional ownership claim on an on-going business enterprise. In contrast to other assets that carry non-monetary benefits (such as the consumptive value of the house we live in, or the pleasure derived from owning a painting), stocks derive their value, by and large, from their claim to a firm's future cash flows. Valuing these future cash flows is an integral part of value investing because it provides investors with an independent measure of firm value that could be used to *challenge* and perhaps *discipline* the current market price.

Value investors buy stocks that appear to be cheap relative to their intrinsic value, and sell (even sell short) stocks that seem expensive. One of the most remarkable regularities in the empirical asset pricing literature has been the fact that value investing is consistently associated with positive abnormal returns. Both empirical academic studies and the evidence from a host of professional asset managers seem to confirm this. A substantial literature in finance and accounting shows that firms trading at lower pricing multiples, with stronger balance sheets, more sustainable cash flows, higher profitability, lower volatility, lower Beta, and lower distress risk, actually earn *higher*, not lower, future stock returns. This pattern in cross-sectional returns, which we refer to collectively as the “value effect”, was first recognized by famed Columbia University professor, Benjamin Graham, and documented as early as 1934. Various elements of this effect have been confirmed (and rediscovered) by a host of academic studies in the ensuing 80 years.

A common misconception among many academics and financial practitioners is that “value” is equivalent to “cheapness.” Thus in many academic studies, “value stocks” are defined simply as those trading at lower market multiples (i.e., lower M/B, P/E, CF/P, etc.).<sup>39</sup> This chapter illustrates that sensible value investing is not merely finding “cheap” stocks; it requires finding “quality” stocks (firms with strong fundamentals) trading at reasonable prices. We will provide some examples of how accounting numbers can be used, and are indeed being used, by successful professional investors to identify quality stocks. In fact, we believe many recent

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<sup>39</sup> For example, Fama and French (1992), Lakonishok, Shleifer, Vishny (1994).

results from academic research are extremely useful to value investors in their search for quality companies trading at reasonable prices.

In the remainder of this chapter, we revisit the theoretical underpinnings of the value effect, and summarize what is now an extensive body of evidence in support of its existence. We will get to the theory part shortly, but let us once again begin with an illustration, this time taken from the writings of Benjamin Graham.

### ***3.2 Benjamin Graham as a Quant***

In one of the earliest editions of *Security Analysis*, which he co-authored with David Dodd in 1934, Graham proposed a simple stock screen. While the numbers in the screen have varied slightly across editions, the original form of this screen is preserved. Here is the original screen.<sup>40</sup> Any stock that possesses all 10 of the following characteristics, according to Graham, would be a worthwhile investment:

1. Earnings to price ratio that is double the AAA bond yield.
2. PE of the stock has less than 40% of the average PE for all stocks over the last 5 years.
3. Dividend Yield > Two-thirds of the AAA Corporate Bond Yield.
4. Price < Two-thirds of Tangible Book Value.
5. Price < Two-thirds of Net Current Asset Value (NCAV), where net current asset value is defined as liquid current assets including cash minus current liabilities.

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<sup>40</sup> We are indebted to Professor Aswath Damodaran for bringing our attention to this screen. See Damodaran (2012) for an excellent historical perspective on value investing. See Cottle, Murray, Block(1988) for a more recent version of the Graham and Dodd classic.

6. Debt-Equity Ratio (Book Value) has to be less than one.
7. Current Assets > Twice Current Liabilities.
8. Debt < Twice Net Current Assets.
9. Historical Growth in EPS (over last 10 years) > 7%.
10. No more than two years of declining earnings over the previous ten years.

When presenting this screen, we ask students to group these 10 factors into two general categories (that is, find five factors that have more in common with each other than with the other five factors). If you stare at this screen for a few moments, you will notice that there are in fact two natural groupings. The first five factors appear to be more closely linked to each other than they are to the next five factors that follow.

You might also recognize that the first five factors are all measures of “cheapness”. The first two factors compare a company’s stock price to their reported earnings, and encourage us to buy stocks whose P/E ratio is below a certain threshold. The next three compare a stock’s price to its dividends, book value, and net current asset value (NCAV), respectively. Taken together, these first five factors are all instructing us to buy companies whose prices are “cheap” relative to reference measures extracted from historical financial statements.

The next five factors differ from the first five in that they do not involve the stock price. As a group, we might refer to these five factors as measures of a firm’s “quality”. Notice that these factors are pure accounting constructs: financial ratios or growth rates; accounting numbers over accounting numbers. Factors 6 through 8 measure debt (or leverage), as well as short-term liquidity (or solvency). Factors 9 and 10 are measures of a company’s historical earnings growth rate and the consistency of that growth. In short, Graham wants to buy firms with low leverage, high solvency, and a high and consistent rate of growth, sustained over a period of time. Quality

firms, according to Ben Graham, are those with high and steady growth, low leverage, and ample liquidity.

Does this strategy work? A few years ago, a Stanford University MBA student, Becca Levin, designed a slightly updated version of this screen. Becca used the same basic formulation as Graham, but updated a couple of the constructs (substituting free-cash-flow yield, for example, in place of dividend yield; and requiring just 5-years of past earnings growth rather than 10-years). We recently conducted a test of this strategy using a dataset of U.S. companies over the most recent 14 years (1/2/1999 to 11/9/2013).

The Levin-Graham strategy is quite simple to implement. Specifically, we assign a +1 score if a firm meets each condition; top firms can receive a maximum score of 10, bottom firms can score as low as 0. At the beginning of each quarter, all firms are sorted into 10 portfolios according to their Levin-Graham score. We then compute the equal-weighted return for each of these 10 portfolios over the next three months. The test is performed using “as reported” Compustat data, with no survivorship or restatement issues. All variables are computed using publicly available data as of the date of portfolio formation (no “peek ahead” bias). To avoid illiquid stocks, we include only firms with a price of \$3 or more. The results are reported in Figure 1.

[Insert Figure 1]

This figure reports the equal-weighted return to each of these 10 portfolios over the next three months (annualized, assuming quarterly rebalancing).<sup>41</sup> The right-most column represents EW-returns to a portfolio of firms with the highest score, and so on. The eleventh (left-most) column is the return to the S&P400 Midcap (value-weighted) index over the same time period, included for comparison.

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<sup>41</sup> Note that value investors can employ two related sets of strategies. The first set is comprised of fundamentally oriented value strategies such as Levin-Graham screen presented above that tend to be more focused on comparing price relative to value for a given firm. The second set is comprised of systematically oriented value strategies that compare valuation metrics across related firms in the cross-section. See Land and Lundholm (1996) for a discussion of the potential difference in the impacts these strategies on price formation.

Remarkably, this 80-year-old screen continues to predict stock returns in the 21<sup>st</sup> century! In general, cheaper and higher quality stocks earn higher returns over the next 3-months. On an annualized basis, firms in the top two-deciles of the screen averaged around 14% per year, while firms in the bottom two-deciles averaged around 5%. The difference between these stocks is 9% per year (or equivalently, around 2.25% per quarterly rebalancing period). For comparison, the value-weighted S&P400 Midcap index returned only 8.5% over this time period. The decile results are not monotonic, but by and large, we see that cheaper and higher-quality stocks do earn higher returns even in the most recent 14 year period, in what is arguably the most efficient stock market in the world.

### ***3.3 A Bit of Theory Might Help***

What might account for this performance? Was this an unusual time period in U.S. history? To proceed further, we need to introduce a bit of valuation theory.

#### *The Residual Income Model (RIM)*

In the early to mid-1990s, Professor James Ohlson wrote a series of influential studies on equity valuation featuring what became known as the “residual income model” (RIM).<sup>42</sup> The RIM had its origin in the early work of financial economists.<sup>43</sup> Although the original model predates his work by several decades, Ohlson helped many academics to refocus on the importance of the RIM as a means to understanding the relation between accounting data and firm value.<sup>44</sup>

The most common form of the RIM in the academic literature expresses a firm’s value in terms of its current book value and future expected abnormal accounting rates-of-returns:

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<sup>42</sup> Ohlson (1990, 1991, 1995), Feltham and Ohlson (1995).

<sup>43</sup> See, for example, Preinreich (1938), Edwards and Bell (1961), Peasnell (1982), and Lehman (1993).

<sup>44</sup> Bernard (1995), Lundholm (1995), and Lee (1999) offer less technical discussions on the implications of Ohlson’s work. Many excellent books, including Healy and Palepu(2012), Penman (2010, 2012), and Whalen, Baginski, and Bradshaw (2010), discuss implementation details. Ohlson often underscores the fact that a RIM lacks content without additional assumptions (for example, the “Linear Information Dynamics” assumptions in Ohlson (1995)).

$$\begin{aligned}
P_t^* &= B_t + \sum_{i=1}^{\infty} \frac{E_t[NI_{t+i} - (r_e * B_{t+i-1})]}{(1+r_e)^i} \\
&= B_t + \sum_{i=1}^{\infty} \frac{E_t[(ROE_{t+i} - r_e) * B_{t+i-1}]}{(1+r_e)^i} \tag{1}
\end{aligned}$$

where  $B_t$  = book value at time  $t$ ;  $E_t[.]$  = expectation based on information available at time  $t$ ;  $NI_{t+i}$  = Net Income for period  $t+i$ ;  $r_e$  = cost of equity capital; and  $ROE_{t+i}$  = the after-tax return on book equity for period  $t+i$ .<sup>45</sup> In this formula, the Residual Income (RI) for period  $t$  is defined in terms of period  $t$  earnings, minus a normal rate-of-return on the beginning capital base.

Notionally:  $RI_t = NI_t - (r * B_{t-1})$ .

An attractive aspect of the RIM is that it allows us to express firm value (i.e., the present value of a firm's future cash flows) in terms of variables that appear in financial statements. In fact, with a sharp pencil and some high school algebra, it is easy to show that equation (1) is simply a mathematical re-expression of the dividend discount model, with the addition of the "Clean Surplus Relation".<sup>46</sup>

Setting aside the details on the right-hand-side of equation (1) for a moment, notice that this equation has decomposed firm value into two components:

$$Firm\ Value_t = "Capital_t" + "PVRI_t", \tag{2}$$

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<sup>45</sup> In this formula, the Residual Income for period  $t$  is defined in terms of period  $t$  earnings, minus a normal rate-of-return on the beginning capital base. Notionally:  $RI_t = NI_t - (r * B_{t-1})$ . Note also that this formula refers to expected ROE which, strictly speaking, is not equivalent to expected earnings relative to expected book value. The mathematic derivation calls for the latter (Penman, 1991).

<sup>46</sup>Clean surplus accounting requires all gains and losses affecting the starting capital to flow through earnings. In short, any changes in the capital base must come either from earnings during the period or from net new capital flows. For example, if we define the starting capital base as the beginning-of-year book value, then the ending book value must equal the starting book value plus earnings minus net dividends:  $(B_t = B_{t-1} + NI_t - D_t)$ .

where the book value at period  $t$  is “ $Capital_t$ ”, or the initial Invested Capital base, and the rest of the right-hand-side is the “Present Value of Future Residual Income”, hereafter referred to as “ $PVRI_t$ ”.

Equation (2) highlights the fact that Firm Value (what the firm is worth today), is always a function of two components: Invested capital (the asset base we start with today), and “Present Value of Future Residual Income” (where this asset base is going; in other words, our projection of the future value-enhancing growth in the capital base).

As it turns out, what we use as our starting capital base ( $Capital_t$ ) really does not matter (see Penman (1996, 1997)). In equation (1), the current book value was used as the starting capital, but we could have chosen virtually any number as a starting capital. So long as our forecasts obey two simple rules of internal consistency, the resulting Firm Value estimate will be equivalent to the present value of a firm’s future dividends.<sup>47</sup>

Subsequent studies featured several alternative measures of the invested capital base other than book value. For example, a firm’s capitalized one-year-ahead earnings forecast, or its current year sales revenue.<sup>48</sup> The general RIM formula tells us that, for each invested capital choice, we can derive an equivalent expression for the present value of the corresponding residual income term. In other words, for each  $Capital_t$  selected, we can compute a matching  $PVRI_t$  such that the sum will always be mathematically equivalent to the present value of future payout to shareholders.<sup>49</sup>

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<sup>47</sup> The two consistency requirements are: First, the three elements of RI need to be consistently defined: Having specified the capital base ( $Capital_t$ ),  $Earnings_t$  must be the income to that capital base in year  $t$ , and  $r$  must be the cost-of-capital associated with this source of capital. Second, the evolution of the capital base in this model must follow the Clean Surplus Relation (CSR).

<sup>48</sup> For example, Ohlson and Juettner-Nauroth (2005) and Easton (2004) use capitalized one-year-ahead earnings ( $EARN_{t+1}$ ) as the starting capital base in developing the Abnormal Earnings Growth Model (AEGM). Bhojraj and Lee (2002) use the RIM formula to estimate a matching PVRI for each firm’s enterprise-value-to-sales (EV/S) ratio.

<sup>49</sup> Although the arithmetic carries through, clearly not all measures of capital are equally sensible from an economic perspective. A full analysis of which “capital-in-place” measures might be more sensible is beyond the scope of the current discussion. However, it might be worth noting in passing that granting greater latitude to management in

How might RIM help us to do fundamental analysis? For one thing, it gives us a much clearer view into the performance indicators that should drive market multiples. For example, dividing both sides of equation (1) by a company's book value, we can re-express the price-to-book ratio in terms of expected ROEs:

$$\frac{P_t^*}{B_t} = 1 + \sum_{i=1}^{\infty} \frac{E_t[(ROE_{t+i} - r_e) B_{t+i-1}]}{(1 + r_e)^i B_t}, \quad (3)$$

where  $P_t^*$  is the present value of expected dividends at time  $t$ ,  $B_t$  = book value at time  $t$ ;  $E_t[.]$  = expectation based on information available at time  $t$ ;  $r_e$  = cost of equity capital; and  $ROE_{t+i}$  = the after-tax return on book equity for period  $t+i$ .

This equation shows that a firm's price-to-book ratio is a function of its expected return on equity (ROE), its cost-of-capital ( $r_e$ ) and its future growth rate in book value (which itself depends on future ROEs, and  $k$ , the dividend payout ratio).<sup>50</sup> Firms that have similar price-to-book ratios should have present values of future residual income (the infinite sum in the right-hand-side of equation (3)) that are close to each other.

Using the RIM framework outlined in equation (3), Penman et al. (2014) demonstrate how accounting numbers are central for pricing because they influence expectations of forward earnings and subsequent earnings growth. Starting with a RIM representation, Penman et al. (2014) first shows that the cost of equity capital collapses to a firm's forward earnings yield in the absence of earnings growth.

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reappraising balance sheet items could have the unhappy side-effect of producing less comparable accounting rates-of-return, both for cross-sectional and for time-series analyses.

<sup>50</sup> Technically, it is not expected ROE per se, which appears in the formula, so much as the expected Net Income divided by the expected Book Value. Recall from the CSR,  $B_{t+1} = B_t + NI_t - DIV_t = B_t * (1 + (1 - k) ROE_{t+1})$ , therefore, the growth in book value is simply:  $B_{t+1} / B_t = 1 + (1 - k) ROE_{t+1}$ .

Of course, firms would be far easier to value in the absence of growth. However, the need for more granular valuation models stem from the fact that earnings growth varies in the cross-section. In the presence of growth, the Penman et al. (2014) framework helps illustrate that accounting knowledge is essential for pricing because it conveys information about expected earnings growth as well as the risks underlying these expectations. Below, we outline how investors can leverage the RIM framework to identify value by using accounting information to learn about the quality of a firm's earnings potential relative (i.e., its quality) as well as the cost of the firm relative to its assets in place (i.e., its cheapness).

### ***3.4 The Two Sides of Value Investing***

A key insight that falls directly from this analysis is that ***value companies are not just those that are cheap relative to capital-in-place, but include those that are cheap relative to the present value of their future residual income.*** A common misperception about value investing, at least among academics, is that it simply involves buying stocks that are cheap relative to measures of capital-in-place. For example, many academic studies (mostly from finance) define value stocks as firms that trade at lower market multiples of book value, earnings, or enterprise value (e.g., P/B, P/E, or EV/S). Accounting-based valuation demonstrates the seriousness of this error, because cheapness (as expressed through lower market multiples) is only one (and arguably the much less interesting) part of value investing.

As the residual-income framework makes transparent, a firm's true fundamental value is made up of two key elements: **Firm Value = Capital-in-place + Growth-opportunities.** The problem with typical cheapness indicators is that they only compare the price of a stock to its capital-in-place (book value, capitalized-earnings, or sales), and miss entirely the second element in equity valuation.

The most successful fundamental investors, beginning with Ben Graham, have always viewed Value Investing as consisting of two key elements: (1) Finding "quality" companies, (2) Buying them at "reasonable prices". In simple notation:

## *Value Investing = Cheapness + Quality*

A firm's market multiple is a measure of cheapness relative to assets-in-place, but that is the easier and arguably less interesting part of value investing. The more interesting part requires an investor to assess a firm's quality – that is, the present value of its expected future residual income (PVRI), using various currently available performance indicators. That is, of course the heart of what we call fundamental analysis. The best fundamental investors focus on buying quality, for a given level of cheapness. It is in this spirit that Ben Graham built his original stock screen. Looking back at his quality factors (factors #6 to 10), Graham intuitively recognized that firms with lower leverage, higher liquidity, and a high rate of steady growth are those with the best chance of generating high rates of return in the future. Or, in RIM parlance, he believed these are the high PVRI stocks.

### *3.5 Lessons from the Field*

This overarching theme of “cheapness+quality” is extremely helpful to bear in mind when trying to understand the investment approaches of investors, such as Warren Buffett, Charlie Munger, Joel Greenblatt, Julian Robertson, and a host of others who grew up under their tutelage (e.g., the extremely successful “Tiger Cub” funds, such as Lone Pine, Viking, and Maverick Capital, all of which had their roots in Julian Robertson's Tiger Fund (1980-2000)). Let us consider one such example.

#### Joel Greenblatt and the Magic Formula

Joel Greenblatt is an American academic, hedge fund manager, investor, and writer. Like Graham, Greenblatt's career straddled academia and Wall Street. In 1985, he founded a hedge fund, Gotham Capital, which focused on special situation investing. Greenblatt and his cofounder, Robert Goldstein, compounded Gotham's capital at a phenomenal 40 percent annually before fees for the 10 years from its formation in 1985 to its return of outside capital in 1995. After returning all outside capital, Greenblatt and Goldstein continued to invest their own capital in special situations. In 1999, he wrote his first best-seller, *You Can Be a Stock Market Genius*, which described the special situation investment strategy responsible for Gotham's success.

What Greenblatt is best known for, however, is his second book, *The Little Book that Beats the Market*. Published in 2005, the first edition sold over 300,000 copies and was translated into 16 languages, thus propelling Greenblatt to celebrity-investor status. As Greenblatt described it, this book was the product of an experiment, in which he wanted to see whether Warren Buffett's investment strategy could be quantified. He knew that the subtle qualitative judgment of "the Sage from Omaha" was probably beyond the reach of machines. Still, he wondered whether some of Buffett's magic might be bottled.

Studying Buffett's public pronouncements, most of which came in the form of Chairman's letters from Berkshire Hathaway, Inc., Greenblatt discerned a recurrent theme. As Buffett often quipped: "*It is far better to buy a wonderful company at a fair price than a fair company at a wonderful price.*"<sup>51</sup> Buffett was not just buying cheap companies, Greenblatt observed, he was looking for quality companies at reasonable prices. What would happen if we tried to create a mechanical stock screen that invested in high-quality businesses trading at reasonable prices?<sup>52</sup>

The results were so impressive that in *The Little Book that Beats the Market*, Greenblatt called this strategy *The Magic Formula*. The details of the formula are laid out in Appendix A. As you will see from this Appendix, it is a remarkably simple strategy. Greenblatt ranked companies based on just two factors: Return-on-capital (ROC) and earnings-yield (EY). The Magic Formula, in a nutshell, looks for companies with a history of consistently high past ROC (5 years of at least 20% annually), and bought the ones currently trading at the lowest earnings-yield. That's it!

Several points are worth noting. First, the formula works (or more precisely, it *has* worked for a long time). This basic formula has been thoroughly tested using U.S. data, both by Greenblatt

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<sup>51</sup> From the Chairman's Letter, Berkshire Hathaway, Inc., Annual Report, 1989.

<sup>52</sup> At least one other accounting academic came to the same conclusion about Buffett's investment strategy. In his 2010 book, *Buffett beyond Value*, Professor Prem Jain studied over 30 years of Buffett pronouncements and also came to the same conclusion (Jain (2010)). Buffett favored quality growth (or in RIM parlance, high PVRI firms) over cheapness.

and by others. Firms ranked at the top of this screen have outperformed their peers by a wide margin over the past 50 years.<sup>53</sup> Second, it is really *very similar* to what Ben Graham was doing many years earlier! Five years of high and consistent growth... low P/E ratios... sounds familiar? The more things change, the more they stay the same.

But of course, in the context of the RIM, all this makes sense. Ben Graham, Warren Buffett, and Joel Greenblatt, they are all trying to do the same thing – find firms with high expected PVRI trading at reasonable market multiples. Consider Buffett’s most often repeated four-fold dictum: (1) Only invest in a business you can understand; (2) Look for companies with a sustainable competitive advantage, (3) Bet on companies with high-quality management teams, and (4) Buy with a good “Margin of Safety.” The last point is easiest to understand and implement – buy firms with an attractive valuation relative to its capital base. What do the first three principles tell us? Are they not simply pointing us towards firms with a greater likelihood of high sustainable ROE’s in the future? The verdict from the field is clear: Quality pays.

### ***3.6 Empirical Evidence from Academic Studies***

Once we have the overarching valuation framework firmly in place, it is remarkable how well the evidence from empirical studies line up with the theory, and with the field evidence from investors. Let us now turn to this evidence.

#### *Cheapness*

An enormous body of literature in accounting and finance documents the tendency of value stocks (stocks with low prices relative to their fundamentals) to outperform glamour stocks (stocks with high prices relative to their fundamentals). Common measures of value are the book-to-market ratio (Stattman (1980), Rosenberg, Reid, and Lanstein(1985), Fama and French (1992)), the earnings-to-price ratio (Basu (1977), Reinganum (1981)), the cashflow-to-price ratio (Lakonishok et al. (1994), Desai, Rajgopal, and Venkatachalam (2004)), and the sales-to-enterprise-value ratio (O’Shaughnessy (2011)). The strength of the value effect varies over time

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<sup>53</sup> See for example, Gray and Carlisle (2013, Chapter 2) for a detailed replication of the formula using U.S. data from 1964-2011.

and across stocks, but the broad tendency of value stocks to outperform glamour stocks is a highly robust finding in the academic literature.

While academics generally agree on the empirical facts, there is much less consensus on the reason behind these findings. Some feel the evidence clearly indicates that value stocks are underpriced (i.e., they are bargains); others believe value stocks are cheap for a reason, and that common measures of value are also indicators of some sort of risk. For example, Fama and French (1992) suggest low price-to-book (P/B) stocks are more vulnerable to distress risk, and Zhang (2005) argue that these stocks have more “trapped assets,” and are thus more susceptible to economic downturns.<sup>54</sup>

### Quality

The academic evidence in favor of quality investing has been perhaps a bit more difficult to recognize. Up to now, academics have not always agreed on what a quality firm might look like. Many papers have examined the persistence of earnings, for example, or the ability of accounting-based variables to predict future returns, but most have not done so under the quality rubric. Yet once we begin to piece together the evidence, and the composite sketch begins to fill it, the picture that emerges bears a remarkable resemblance to the indicators of quality as first expressed by Ben Graham in his original screen. Delightfully, the evidence also concords extremely well with what we might expect from valuation theory.

Holding a company’s market multiple (e.g., its price-to-book ratio) constant, what kind of firm *should* an investor pay more for? If we define quality firms as those that *deserve* a higher multiple, then valuation theory tells us the answer. According to the RIM, quality firms are those with a high present value of future residual income (high PVRI). The task of the empiricist is to examine which company characteristics, or perhaps performance metrics, might serve as useful indicators of future PVRI.

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<sup>54</sup> For a much more detailed review of this debate, see Zacks (2011; Chapter 10).

What are the key components of a company's PVRI? Of first order importance would be measures of future profitability and growth, since these elements are the primary drivers of firms' future ROE. Also important would be measures of safety. To the extent that safer firms deserve a lower cost-of-capital ( $r_c$ ), and holding future expected cash flows constant, safer firms will deserve a higher PVRI. Finally, the expected rate of payout should play a role. Firms that maintain the same profitability and growth rates while paying back more capital to investors are, all else equal, deserving of a higher PVRI.

Note that we have thus far only discussed fundamental valuation, not market mispricing per se. Superior value estimation does not always translate into better returns prediction. This is because the latter involves a systematic mistake (some sort of error) in the current price; the former does not. It is possible that a historical indicator of quality (such as a firm's past ROE) is a strong predictor of future PVRI, but the market is aware of this and has appropriately priced it. In this case, we would not expect higher returns to an ROE-based strategy. Empirically, there are certainly seemingly sensible value+quality combinations that do not result in superior returns predictions. However, if prices generally converge towards fundamentals in the long run, we should expect better valuation estimates to on average lead to superior returns prediction (see Lee, Myers, and Swaminathan (1999) for a more detailed discussion).

Prior evidence is broadly consistent with these observations. In general, stable, safe, profitable firms with solid growth, good cash flows, lower risk, and higher payouts do in fact earn higher future returns. Below, we provide a brief survey of this evidence from prior research and discuss their relation to our overarching valuation framework.

Profitability and Growth Piotroski (2000) shows that firms with better ROAs, operating cash flows, profit margins, and asset turnovers, consistently earn higher returns. Using eight fundamental indicators of firm performance and general health, he created a composite "F-Score." His evidence shows that F-Score is able to separate winners from losers from among stocks in the lowest P/B quintile (value stocks). Mohanram (2005) performs a similar exercise among high P/B firms (growth stocks) and find growing firms outperform firms with poor growth. Piotroski and So (2012) use the F-Score to show the value/glamour effect is attributable

to errors in market expectation about future fundamentals. Using I/B/E/S analysts' forecasts, Frankel and Lee (1998) show that, holding P/B constant, firms with higher forecasted earnings earn higher returns, particularly when correcting for predictable errors in the analysts' consensus estimates. Overall, the evidence suggests that firms with higher profitability (past or forecasted) earn higher subsequent returns.

Earnings Quality It is not simply the *quantity* of earnings that matters, the *quality* (the expected sustainability or persistence) of that earnings also matters. For example, Sloan (1996) and Richardson et al. (2005) show that the cash flow component of earnings is more persistent than the accrual component. Novy-Marx (2013) shows that Gross Margin (Sales – Cost of Goods Sold) is an even better measure of core profits than bottom-line earnings. In this study, profitable firms generate significantly higher returns than unprofitable firms, despite having significantly higher valuation ratios.

Another line of research explores the usefulness of accounting numbers in identifying financial shenanigans. Beneish (1999) estimates an earning manipulation detection model based entirely on reported numbers from the period of alleged manipulation. In out-of-sample tests, Beneish, Lee, and Nichols (BLN, 2013) shows this model correctly identified, in advance of public disclosure, a large majority (71%) of the most famous accounting fraud cases that surfaced after the model's estimation period. Perhaps even more significantly, BLN shows that the “probability of manipulation” (M-score) from the original Beneish model is a powerful predictor of out-of-sample stock returns – i.e., firms that share traits with past earnings manipulators earn lower subsequent returns after controlling for multiple other factors, including accounting accruals.

Overall, these studies show that various accounting-based measures of cash flow profitability or earnings quality are even better predictors of future returns than simple measures based on reported earnings.

Safety Safer stocks earn higher returns. This result is remarkably robust across many measures of safety. For example, *lower volatility* firms actually earn higher, not lower, returns

(Falkenstein (2012), Ang, Hodrick, Xing, and Zhang (2006)). *Lower Beta* firms in fact earn higher returns (Black, Jensen, and Scholes (1972), Frazzini and Pedersen (2013)). Firms with *lower leverage* earn higher returns (George and Hwang (2010), Penman et al. (2007)). Most strikingly, firms with *lower levels of financial distress* also earn higher returns (Altman (1968), Ohlson (1980), Dichev (1998), Campbell, Hilscher, and Szilagyi (2008)).<sup>55</sup> In short, firms that are safer, by many measures of safety, actually earn higher returns.

Put simply, firms with higher volatility, higher Beta, higher leverage, and higher bankruptcy risk actually earn lower returns. This finding does not make sense in an equilibrium asset pricing context – in equilibrium, firms with higher risk should be rewarded with higher future returns. However, the result makes perfect sense if we believe that these risk measures are associated with the discount rate markets use to compute a firm's PVRI. Viewed in this context, safer firms have lower cost-of-capital ( $r_c$ ), and we would expect their PVRI (and thus their firm value) to be higher than the riskier firms, all else equal. If the market underappreciates a firm's true PVRI (as we have seen in the case of firms' Profitability and Growth indicators), then safer firms will in fact earn higher future realized returns.<sup>56</sup>

Payout Finally, companies who make higher payouts to shareholders and creditors also earn higher future returns. For example, companies that repurchase their shares tend to do well (Baker and Wurgler (2002), Pontiff and Woodgate (2008), McLean, Pontiff, and Watanabe (2009)), while firms that issue more shares tend to do worse (Loughran and Ritter (1995), Spiess

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<sup>55</sup> Both Dichev (1998) and Campbell et al. (2008) find strong evidence that distress risk is actually *negatively* associated with subsequent returns. Dichev used Altman's Z-score and Ohlson's O-Score and show that going long in the 70% of firms with low bankruptcy risk, and shorting the remaining 30%, yields *positive* returns in 12 out of 15 years (1981-1995). Campbell et al. (2008) sort stocks by into value-weighted portfolios by failure probability, and find that average excess returns are strongly, and almost monotonically, negatively related with the probability of failure. The safest 5% of stocks have an average excess yearly return of 3.4%, while the riskiest 1% of stocks have an average return of -17.0%.

<sup>56</sup> Consistent with this argument, Chava and Purnanadam (2009) show that although distress risk is *negatively* correlated with future realized returns, it is *positively* correlated with a firm's market-implied cost of capital. In other words, the market *does* use a higher implied discount rate when discounting the future earnings of high distress firms; however, because these firms are still over-priced on average, they still earn lower future realized returns.

and Affleck-Graves (1995)). A similar pattern is observed for debt issuances. Firms that issue more debt earn negative abnormal returns (Spiess and Affleck-Graves (1999), Billett, Flannery, and Garfinkel(2006)), while firms that retire their debt earn positive abnormal returns (Affleck-Graves and Miller (2003)). In fact, Bradshaw et al. (2006) show that it is possible to measure these effects using a measure of net external financing activities computed from companies' Statement of Cash Flow. Taken together, these findings are quite consistent with the RIM framework: firms that are returning capital at a faster rate (firms with a higher  $k$ ), have more positive PVRI.

In short, what types of firms might be deemed higher quality? In other words, which firm characteristics are associated with higher future ROEs, lower cost-of-capital, and higher payouts? Prior studies suggest these are safe, profitable, growing firms that are also returning more of their capital to their investors. These facts are exactly what we would expect if markets underappreciate fundamental value, as reflected in current financial statements. They are much more difficult to reconcile with popular explanations of the value effect as a risk premium, as the quality firms are more profitable, less volatile, less prone to distress, have more persistent future cash flows, and lower levels of operating leverage.

*Asness, Frazzini, and Petersen (2013)*

In a fascinating new study, Asness, Frazzini, and Petersen (2013) pulls these disparate strands of quality investing together. In this study, the authors define quality firms as stocks that are “safe, profitable, growing, and well-managed.” They argue that all else equal investors should be willing to pay more for such firms. They show that in fact the market does not pay a high enough premium for these quality stocks. Sorting firms on the basis of their quality metric, they create a “Quality Minus Junk” (QMJ) portfolio, and find that this portfolio earns positive risk-adjusted returns in 22 out of 23 countries.

For their empirical tests, they compute a composite quality score for each firm based on the following 21 performance indicators, grouped into four categories. Each variable is ranked, and then normalized by subtracting its own mean and dividing by its own standard deviation:

### I. Profitability (6 variables)

Bet in favor of firms with high earnings (ROA, ROE), high gross-profit (GPOA, GMAR) and high operating cash flow (CFOA, ACC). The numerators are current year earnings, gross margin, or operating cash flows; the denominators are total assets, book equity, total sales, or (in the case of ACC) total earnings.

### II. Growth (6 variables)

Bet in favor of firms with the most positive changes in these profitability variables over past 5 years (e.g.,  $\Delta GPOA = (GP_t - GP_{t-5}) / TA_{t-5}$ ); where  $GP = REV - COGS$ . In other words, Asness, Frazzini, and Petersen (2013) define growth firms as those whose gross margin, or earnings, or cash flows, have grown the most over the past five years, relative to the year t-5 capital base.

### III. Safety (6 variables)

Bet against firms with Beta (BETA), high volatility in returns and earnings (IVOL, EVOL), high leverage (LEV), and high levels of financial distress (O-score, Z-score). For this composite, the authors consolidate six measures of “safety” based on prior studies. In essence, safe firms are defined as those with low Beta, low volatility, low leverage, and low financial distress.

### IV. Payout (3)

Bet against firms with: high net equity issuance\_(EISS), high net debt issuance\_(DISS), low net payout ratio\_(NPOP) over past five years. Again, consistent with prior studies, Asness, Frazzini, and Petersen (2013) define high payout firms in terms of net new issuances, plus dividends.

Notice how well these concepts map into the RIM framework. The first six indicators (past ROE, ROA, GPOA, GMAR, CFOA, and ACC) capture profitable firms that have higher gross margin, and a higher proportion of cash flow to accruals in their reported earnings. The next six indicators measure improvements in these variable dimensions of profitability. In the RIM framework, these 12 variables are all likely to be associated with higher future ROEs. Not

surprisingly, Asness, Frazzini, and Petersen (2013) find that these measures are strongly correlated with P/B ratios in the cross-section.

More interestingly, Asness, Frazzini, and Petersen (2013) shows that these variables also predict cross-sectional returns – that is, more profitable firms and firms with strong growth over the past five years consistently earn higher returns than firms with low profitability and low growth. To be fair, most of these variables have been reported by prior studies as being useful in returns prediction. Nevertheless, this study provides compelling evidence in support of the prediction from a simple RIM analysis – firms with high and persistent profits have high PVRI, and the market does not seem to fully price in this quality metric.

The main empirical finding in Asness, Frazzini, and Petersen (2013) is that safer firms also earn higher future returns. They define safe firms as those with lower Beta, lower volatility (measured in terms of both idiosyncratic returns (IVOL) and past earnings (EVOL)), lower leverage (LEV), and lower financial distress (O-Score and Z-Score). While this result might be counter-intuitive for efficient market advocates, it is in fact quite easy to understand in terms of the RIM framework. Holding expected cash flows constant, safer firms are worth more (i.e. they should have lower discount rates). To the extent that markets underappreciate this dimension of firm valuation, the safer firms would yield higher future returns.

Finally, Asness, Frazzini, and Petersen (2013) show that firms with high net payouts (i.e. those with low net equity issuances, low debt issuances, and high dividends), are also worth more. In the RIM framework, this is not surprising either. Firms which are able to produce the same level of growth as other firms while paying back more of their capital to investors are worth more. Again, when we measure the quality component of firm value (PVRI) more accurately, we are better able to identify firms that earn higher future returns.

### **3.7 Why does value investing continue to work?**

Two stylized facts emerge from the preceding literature survey: (a) smart value investing, which incorporates both cheapness and quality, is associated with higher future stock returns, and (b) these strategies are being actively exploited by professional investors. These two findings

naturally raise the issue of whether the value effect will persist in the future. Why haven't these effects been fully arbitrated away? Why does anyone continue to buy expensive, low-quality, stocks (i.e., who buys "junk")?

Although a full treatment of this topic is probably beyond the scope of this chapter, the academic literature has proposed at least four reasons for the persistence of the value effect: (a) Risk-based Explanations, (b) Preference-based Explanations, (c) Institutional- and Friction-based Explanations and (d) Behavioral-based Explanations. We briefly review these explanations below.

### 3.7.1 Risk-based Explanations

The first, and longest-standing, explanation is that value stocks are simply riskier, and their higher future returns are a compensation for bearing this risk (e.g., Fama and French (1992)). In support of this risk-based explanation, several studies provide evidence that value and growth stocks possess differential sensitivities to time-varying macroeconomic risks. For example, Vassalou (2003), Cohen, Polk, and Vuolteenaho (2009), and Santos and Veronesi (2010) show that value stocks have greater sensitivities to economy-wide profitability than growth stocks. Similarly, Campbell, Polk, and Vuolteenaho (2010) and Lettau and Wachter (2007) argue that growth (value) stocks display a higher sensitivity to discount rate (cash flow) news. Da and Warachka (2009) demonstrates that the sensitivities of firms' cash flows to aggregate earnings forecasts explain a significant portion of the value premium and Petkova and Zhang (2005) finds that the value premium tends to covary positively with time-varying risk attributes. Lastly, Zhang (2005) argues that the value premium is driven by the differential ability of value and glamour firms to expand and contract their asset base in the face of changing economic conditions. Taken together, these papers suggest that some, if not all, of the documented return performance is an artifact of risk factor exposures that vary across value and glamour firms.

Surely we can agree that value investing involves some risk – i.e., it is not a simple money pump. This is particularly true for the naïve form of value investing commonly discussed in the academic literature. The standard academic approach to value investing is to focus on a stock's

cheapness (as measured by its market multiples). But cheap stocks (high B/M, high E/P, stocks for example) are typically priced that way for a reason – i.e., the population of cheap stocks contain a disproportionately large number of low-quality firms. In fact, as Piotroski (2000; Table 1) showed, the median firm in the highest B/M quintile underperforms the market by over 6% over the next year – even though the mean return to these stocks is higher than the market. Naïve value does involve some risk, and this is borne out in the data.

The problem with the risk-based explanation is that, properly measured, value stocks are actually safer than the growth stocks. Once we incorporate measures of quality, it is clear that value investing does not generally incur higher risk, on average, at least by most sensible measure of risk (e.g., Piotroski and So (2012)). The studies surveyed earlier strongly suggest in fact stocks with more stable cash flows, lower financial distress, lower Beta, and lower volatility, actually earn higher future realized returns. These findings are difficult to reconcile with risk-based explanations.

### 3.7.2 Preference-based Explanations

According to this explanation, some investors *have a preference for* stocks with “lottery-like” payoffs – i.e. return distributions that are right-skewed. Stocks that have these features will therefore, all else equal, appear “over-priced” in a mean-variance world (Brunnermeier and Parker (2005) and Brunnermeier, Gollier, and Parker (2007)). Bali, Cakici, and Whitelaw (2011) provide evidence consistent with this phenomenon, and Kumar (2005; 2009) show this effect applies particularly to retail traders.

It seems plausible that a subset of investors might have preferences beyond the mean-variance trade-off considered by standard asset pricing models. For example, investors may behave as if they prefer lottery-like payoffs, however, it might be difficult to empirically separate this explanation from some of the behavioral-based explanations below (in fact, the literature on Information Uncertainty (Jiang, Lee, and Zhang (2005), Zhang (2005)) makes the same point in a behavioral context). But if investors do exhibit an innate preference for lottery-like stocks, the value effect will, of course, be likely persistence well into the future.

### 3.7.3 Institutional- and Friction-based Explanations

#### A. Liquidity-driven Price Pressures

Stock prices are constantly buffeted by non-fundamental price pressures. Sometimes capital flows into or out of an asset simply “herd” in the same direction for liquidity reasons. These provide both opportunities and challenges for value investors.

For example, in Coval and Stafford (2007): “Fire sales” by mutual funds that face redemption pressure due to weak performance in prior quarters can depress the prices of the stocks they own – and these stocks subsequently rebound strongly. Non-fundamental flows should reverse over time, and may not be driven by cognitive biases. The impact of these non-fundamental price changes are not specific to value investing, however, they will contribute to a higher return:risk ratio for investors that trade on value indicators.

#### B. Prudent-Man Concerns

Del Guercio (1996) notes that institutional investors may gravitate toward glamour stocks due to “prudent-man” concerns, which refers to the idea that investments in high profile, glamour stocks are easier to justify as sound decisions (i.e., they make the investor appear prudent). Skewness in institutional investors’ portfolios toward high profile firms can exacerbate the value effect by raising demand for glamour stocks. Similarly, as noted in Green, Hand, and Soliman (2011) and So (2013), to the extent that mispricing emerges because investors equate good companies with good investments, glamour stocks may offer greater ex-post justifiability in case of losses.<sup>57</sup>

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<sup>57</sup> This positive link between a firm’s profile and glamour status is also consistent with the model of capital equilibrium under incomplete information in Merton (1987), which shows that firm value is an increasing function of investor recognition of the firm. See Lehavy and Sloan (2018) for related evidence on the empirical link between investor recognition and expected returns.

Thus, prudent-man concerns can contribute to the persistence of the value effect because institutional investors concerned with their reputations, legal liabilities, and/or client relationships with sponsors may fail to buy value stocks and sell glamour stocks because potential losses may be harder to justify as prudent investments.

### C. Limits to Arbitrage

Broadly speaking, the value effect may continue to exist because there are limits to arbitrage. In finance textbooks, arbitrage is described as a riskless investment position from simultaneously buying and selling securities, typically requiring no capital investment. This form of textbook arbitrage is commonly referred to as ‘deterministic’ arbitrage. In practice, investors capitalize on the value effect through ‘statistical’ arbitrage, which refers to trades based on statistical evidence of mispricing with respect to the expected value of a given asset. Statistical arbitrage, by contrast, entails significant risks. As noted earlier, although value investing tends to yield positive returns, Piotroski (2000) shows that the median return to holding value firms is negative.

A related form of risk involved with statistical arbitrage is that the returns to value-based strategies are earned over longer holding periods, which reflects the fact that underpriced value firms tend to only gradually rise toward their expected value and overpriced glamour firms tend to only gradually fall toward their expected value. Thus, profiting from the value effect can require significant patience and capital deployment. Shleifer and Vishny (1997) point out that the arbitrage mechanism is constrained because investors withdraw money from investment funds that lose money, even if the losses result from a predictably temporary increase in mispricing. Stocks often reach value (glamour) status in response to upward (downward) revisions in prices, thus, a related risk in value investing is that profiting from underpriced securities may require betting against negative momentum and vice versa for glamour stocks. Related evidence in Brunnermeier and Nagel (2004) shows that several prominent hedge funds bet against the internet bubble in spring 1999 and suffered significant losses and capital outflows as the bubble continued and mispricing deepened. This example illustrates one of the central difficulties in arbitraging the value effect: the uncertainty over when mispricing will correct. When investors’ investment horizon is short, the value effect may persist because the market lacks the sufficient

patience to commit the capital necessary to discipline prices. We discuss related evidence on the limits of arbitrage in more detail in Chapter 5 of the second volume of this book.

#### 3.7.4 Behavioral-based Explanations

The final, and in our view most intriguing, set of explanations for the value effect is rooted in human cognitive behavior. While not mutually exclusive, we group these explanations into four sub-categories.

##### A. Saliency vs. Weight

Human decision-making under uncertainty involves assessing the probability of alternative outcomes. A recurrent theme in cognitive psychology is that human subjects consistently underweight the probability of certain types of events and overweight the probability of others. In their seminal study, Griffin and Tversky (1992) show that signals with high statistical reliability (high “weight”) but are not salient (low “saliency”) are consistently underweighted.

Conversely, highly salient signals with low statistical reliability are often overweighted.

Apparently, Bayesian updating is a difficult cognitive task.

Apply this concept to value investing, firm attribute that are “boring” (non-salient) receive less-than-optimal weight, and those that are “glamorous” (salient) receive more-than-optimal weight. The historical indicators of quality discussed earlier are weighty in terms of their statistical association with future residual income (i.e. sustainable cash flows), but they may not receive sufficient weight in the minds of the investors. Value-based arbitrageurs help to reduce the mispricing, but new “story stocks” arise on a daily basis as markets seek to assimilate the constant flow of news items and/or pseudo-signals.

##### B. Extrapolation

A related behavioral explanation points to evidence in the psychology literature documenting the tendency of individuals to over-extrapolate past trends (e.g., Giffin and Tversky (1992)). This literature asserts that investors underestimate the tendency for trends in firms’ past performance to mean revert and overestimate the tendency for them to continue. Lakonishok et al. (1994)

apply this insight to the pricing of stocks and provide evidence that the value effect is a result of judgment errors where investors overestimate the persistence of past trends in firm performance when valuing firms' future cash flows. Related evidence in Dechow and Sloan (1996) shows that analysts tend to fixate on past earnings growth when forecasting future earnings and that investors tend to naively rely on analysts' forecasts.

By overestimating the tendency of trends to continue, investors extrapolate past growth too far leading to upwardly biased prices for glamour stocks and similarly over-extrapolate past underperformance leading to downward biased prices for value stocks. Under this explanation, investors place excessive weight on recent history and underweight the likelihood of mean reversion in firms' performance.

#### C. Momentum (Positive-feedback) Trading

All pure value investors face the risk that noise trading will push prices even further from fundamental value. Value stocks tend to be negative momentum stocks – and over at least mid-horizon (3 to 12 month) holding periods, value bets run into a momentum headwind.

Strongly negative sentiment typically accompanies really attractive buys based on fundamentals (for recent examples, consider the risk associated with buying Greek assets, or debt instruments issued by U.S. financial service firms, during the global crisis). Thus value inherently faces greater short- and mid-horizon risk from positive feedback trading. The extent to which this matters depends on the holding horizon and the stability and depth of his/her source of capital.

#### D. Over-confidence in high “information uncertainty” settings

Finally, the evidence is clear that firms operating in high “information uncertainty” (IU) settings tend to earn lower subsequent returns. For example, Jiang et al. (2005) define IU in terms of “value ambiguity,” or the precision with which firm value can be estimated by knowledgeable investors at reasonable cost. In Jiang et al. (2005), as well as Zhang (2005), high-IU firms earn lower future returns. In addition, high-IU firms exhibit stronger price as well as earnings momentum effects. Specifically, younger firms, firms with higher volatility, higher volume (i.e. turnover), greater expected growth, higher price-to-book, wider dispersion in analyst earnings

forecasts, and longer implied duration in future cash flows all earn lower returns. In some sense, each of the above phenomena is related to firms' IU measure.

Jiang et al. (2005) argues that all these observations can be traced back to the same behavioral root: People are more overconfident in settings with high "information uncertainty". Applied to value investing, investors tend to overweight elements of firm value that are further out in the future, and underweight those that are nearer at hand (in other words, they use too low an implied discount rate when valuing firm future cash flows). This leads to a tendency to overprice "story stocks" whose cash flows are expected further out into the future.

The overconfidence hypothesis would help to explain why strategies such as the Frankel and Lee (1998) V/P metric (based on short-duration expected cash flows relative to stock prices) can generate higher returns. It would also suggest an explanation for why momentum effects are stronger in high IU settings.

### **3.8 Summary**

Since the days of Benjamin Graham over 80 years ago, fundamental investors have served as a stabilizing force in financial markets. In this article, we reviewed the theoretical foundations of this style of investing including an accounting-based valuation framework for reconciling the vast empirical evidence. We have also attempted to reconcile the investment approaches of some well-known fundamental investors with recent findings from academia.

A number of recent studies provide compelling evidence that historical accounting numbers are informative, and are already playing a useful role in fundamental investing. For example, none of the 21 indicators in the composite quality index featured in Asness, Frazzini, and Petersen (2013) rely on a company's stock price. They are all variables constructed from historical GAAP-based financial statements. Yet together these variables provide a good composite sketch of companies that tend to earn higher returns in the future.

The RIM helps us to understand why. Careful fundamental analysis can help us to derive performance measures that help predict the future profitability and growth of firms. It can also

help us assess the riskiness of a firm, as well as its likely future payout to shareholders. In short, accounting information can help us to evaluate not only the first moment of a firm's future cash flows (i.e., the numerator of the future payoffs), but also its second moment (i.e., the riskiness of these payoffs). As valuation theory shows, both elements are useful in evaluating the present value of a firm's future growth opportunities. In fact, the key predictions from valuation theory dovetail nicely, not only with recent empirical findings in academia, but also with the age-old wisdom espoused by many savvy investors.

We might not be there yet, but we are good ways down the road mapped out for us by Ben Graham almost 80 years ago. The verdict from the field agrees with the verdict from the ivory tower. Buy quality firms at reasonable prices, and use historical accounting numbers to help you achieve that task. It will give you an edge in your investing, and help make markets more efficient as well!

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## Appendix A

### Joel Greenblatt's Magic Formula

The following basic instructions for the Magic Formula are extracted from *The Little Book that Still Beats the Market*, written by Joel Greenblatt and published in 2010. They are included here for illustrative purposes. Interested readers are encouraged to either buy the book or visit Greenblatt's website: [magicformulainvesting.com](http://magicformulainvesting.com) for more details.

#### Greenblatt's Basic Principle:

- Buy good businesses (high return on capital) at bargain prices (high earnings yield).
- Do this consistently by maintaining a portfolio of 20 to 30 stocks, and spreading out the timing of your purchases (buy a few stocks each month throughout the year).
- Hold the winners for at least one year (for tax efficiency reasons).

#### Implementing Greenblatt's "Magic Formula"

- Look for companies with an average ROC of 20% or higher over the past 5-years (see below for details on ROC calculation).
- Among these, pick those ones with the highest earnings-yield (EY).
- Limit stocks to those with at least \$200m in Market Cap; Exclude Utilities; Financials; ADRs; and firms that have reported earnings within the past week.
- Also consider excluding firms with an earnings yield in excess of 20% (which may indicate a data problem or an unusual situation).

#### Detailed Factor Definitions:

- ***Return-on-Capital (ROC) = EBIT / Capital***

Where EBIT is Earnings before interest and taxes, and Capital is defined as: Net PP&E + Net Working Capital.

- ***Earnings Yield (EY) = EBIT / TEV***

Where EBIT is Earnings before interest and taxes, and TEV is defined as: Market capitalization + total debt – excess cash + preferred stock + minority interests (excess cash is cash + current assets – current liabilities).

**Figure 1. Portfolio Returns for the Levin-Graham Stock Screen**  
**Test Period 01/02/1999 to 11/13/2103**

This figure depicts the results of a backtest conducted using a sample of U.S. companies over the 1/2/1999 to 11/9/2013 time period. At the beginning of each quarter, firms are sorted into 10 portfolios according to their Levin-Graham score (based on the original Ben Graham stock screen described in the text). A firm is assign a +1 score if it meets each condition in the screen; top firms can receive a maximum score of 10, bottom firms can score as low as 0. This figure depicts the equal-weighted return to each of these 10 portfolios over the next three months (annualized, assuming quarterly rebalancing). The left-most column is the return to the S&P400 Midcap (value-weighted) index over the same time period. All variables are computed using publicly available data as of portfolio formation, and all firms with available Compustat and CRSP data and a stock price of \$3 or more are included.

