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Asset Management as Creator of Market Inefficiency

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Abstract In this paper, we describe how agency frictions in asset management can generate prime violations of the Efficient Markets Hypothesis, such as momentum, value and an inverted risk-return relationship. Momentum in our theory is associated with procyclical fund flows and price over-reaction, and is more pronounced for overvalued assets. The investors who generate the momentum and who are losing from it are those requiring their asset managers to keep their portfolios close to benchmark indices. Our theory suggests a rethinking of asset management contracts. Contracts should employ measures of long-run risk and return, and benchmark indices that emphasize asset fundamentals. There should also be greater transparency on managers' choice of strategies.

JEL G12 · G14 · G23 · E44

Keywords Financial markets · Asset management · Agency frictions · Momentum · Benchmarking

Introduction

According to the Efficient Market Hypothesis (EMH), formulated by Fama (1970), asset prices should equal the expectation of discounted future cash flows, and asset returns should be unpredictable. The EMH has impacted profoundly

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academic research, financial regulation and market practice. The following are a few examples:

- Most macroeconomic models embed as assumptions implications of EMH, such as the Expectations Hypothesis (EH), according to which long- and short-term bonds should earn the same expected return over the same horizon, and the Uncovered Interest Parity (UIP), according to which all currencies should earn the same expected return over the same horizon and expressed in the same currency.
- The EMH underlies mark-to-market regulation, according to which the solvency of financial institutions, such as insurance companies and pension funds, is evaluated based on the market value of their portfolios. The EMH also suggests a *laissez-faire* approach to capital markets: if asset prices are equal to expected discounted future cash flows, then markets should allocate capital efficiently towards the firms or countries with the best cash flow prospects.
- The EMH underlies the increasingly common practice of passive investing, according to which mutual funds track mechanically market indices. The EMH also permeates active investing because managers of active mutual funds and institutional funds are evaluated relative to benchmark indices and are often constrained in how much they can deviate from these benchmarks.

A vast empirical literature in finance has tested the EMH. While many findings are supportive, there are significant and robust violations. For example, in the government bond market, the slope of the term structure predicts positively the excess returns of long-term relative to short-term bonds, in violation of the EH (Fama & Bliss, 1987); Campbell & Shiller, 1991). In the currency market, the interest-rate differential between two countries predicts positively the return of the currency carry trade, which borrows the low interest rate currency and lends the high interest rate one, in violation of UIP (Bilson, 1981; Fama, 1984). In the stock market, returns exhibit short-term momentum, whereby performance over the past 6-12 months continues on average over the next year (Jegadeesh & Titman, 1993), and long-term reversal, whereby performance over the past 3-5 years reverses on average over the next year (De Bondt & Thaler, 1985). Closely related to reversal is the value effect, whereby stocks with high market value relative to book value earn low expected returns on average (Fama & French, 1992). The value and momentum anomalies have been documented not only for stocks, but also for bonds, commodities and currencies (Asness et al., 2013).

The empirical findings on EMH violations call for theoretical work. Theory is needed to explain why returns are predictable and prices differ from assets' fundamental values. Theory should also determine how the implications of EMH for academic research, financial regulation and market practice should be modified in inefficient markets.

The workhorse model of asset pricing, based on a representative agent who consumes at the economy-wide consumption rate and prices assets based on her marginal utility, can generate some forms of return predictability. Nevertheless, the model's ability to account for the full set of predictability patterns is limited. Intuitively, this is because if predictability were significant, then the representative agent

would trade in such a way as to reduce it. The representative agent model is also too stylized to have meaningful implications for financial regulation and asset management, as it has no room for financial institutions and their regulation.

The Limits of Arbitrage (LoA) paradigm offers a promising framework to study predictability and mispricing, as well as their implications for financial regulation and asset management. The LoA paradigm relies on two premises: (a) agents differ in their expertise to access financial markets, and (b) agency frictions limit the capital of non-experts that experts can manage. Because experts manage a limited pool of capital, mispricing can persist if the agents causing it are wealthy enough. Because the experts can be interpreted as asset managers and the non-experts as the investors or households supplying capital to them, the LoA paradigm can have implications for asset management. It can also have implications for financial regulation. Regulation can seek to mitigate adverse effects that agency frictions have on the contracting parties (micro-prudential regulation) and on equilibrium asset prices and the allocation of capital (macro-prudential regulation).

The LoA paradigm can explain why mispricing is hard to correct once it arises, but not why it arises in the first place. In this paper we sketch a broader research agenda that explains both why mispricing arises and why it is hard to correct. Our research emphasizes agency frictions between financial experts and non-experts, as in the LoA paradigm, and does so in the context of asset management. We show that agency frictions can generate prime violations of EMH. We also derive implications for asset management and financial regulation. Our theory suggests that current practices for evaluating and compensating asset managers are not socially optimal and perhaps not even privately optimal. We propose changes to these practices that can mitigate mispricing and improve investor returns.

We begin by reviewing the rapid growth of the asset management industry and the agency frictions inherent in the relationship between managers and investors. We next describe, drawing on our previous work, how agency frictions affect equilibrium asset prices, and how they generate prime violations of EMH: the value and momentum anomalies (Vayanos & Woolley, 2013; Polk et al., 2022), and the beta and volatility anomalies, whereby risk is unrelated or is inversely related to expected return (Buffa et al., 2022). Underlying our work is that asset prices move in response to fund flows in addition to asset cash flows, and that fund flows are procyclical. Momentum is generated by procyclical flows and is associated with price over-reaction.

Building on our previous work, we derive the new results of this paper. We show that momentum is more pronounced for overvalued assets. We also show that the investors who generate the momentum and who are losing from it are those who require their asset managers to keep their portfolios close to benchmark indices. Tight tracking to benchmarks can thus be a curse for investors and markets.

We conclude this paper by proposing changes to the practices for evaluating and compensating asset managers. We argue that asset management contracts should employ measures of long-run risk and return, as well as benchmark indices that emphasize asset fundamentals. There should also be greater transparency on managers' choice of strategies.

Asset Management and Benchmarking

Asset management has grown rapidly since the middle of the 20th century. Assets under management by United States (U.S.) insurance companies, pension funds, mutual funds and other funds grew from 60% of U.S. gross domestic product (GDP) in the mid-1940s to 240% in the mid-2010s. The United Kingdom (UK) experienced a similar fourfold growth over an even shorter period, from 1980 to 2010. At a global level, professional asset managers held more than $130 trillion of assets in 2021, and that number keeps rising fast.

The growth of asset management is partly driven by the growth in global savings, as increases in life expectancy and GDP render the pool of potential savers larger and richer. It is also partly driven by financial liberalization, which has caused asset prices to rise and financial products to become more accessible to savers (Haldane, 2014).

Asset management involves agency frictions because of principal-agent relationships. There are two main such relationships along the investment chain: one between beneficiaries and asset owners, and one between asset owners and asset managers. In pension funds, for example, the beneficiaries are the workers who contribute toward their pension, the asset owners are the boards of trustees who oversee the management of the workers' assets, and the asset managers are external firms to which the asset owners delegate the management of the assets. For pension funds where assets are managed internally, the principal-agent relationship arises between the trustees and the internal asset managers.

In both principal-agent relationships, that between beneficiaries and owners, and that between owners and managers, there is potential for misalignments of preferences between principals and agents, and uncertainty about agents' ability. Principals must design effective evaluation and compensation systems that help mitigate these issues. In most of this paper, we focus on the principal-agent relationship between owners and managers, and refer to owners more broadly as investors. We touch on the relationship between beneficiaries and owners in the concluding section.

A common approach to tackle the principal-agent relationship between investors and managers is to benchmark the portfolio chosen by managers to a market index and impose tracking constraints, limiting the extent to which the portfolio can deviate from the index. Benchmarking has the advantage of comparing the return of the manager with the default option of passive investment in the index. This provides a well-defined objective for the manager and a clear basis for measuring the manager's contribution and determining any performance-related fee. Tracking constraints relative to the benchmark index limit the potential damage done by an incompetent manager taking excessive risk.

Tracking constraints in practice can take the form of a bound on tracking error, defined as the standard deviation of the difference between the return on a manager's portfolio and the return on the benchmark index. Bounds on tracking error typically range from $\pm 1\%$ to $\pm 6\%$, and are higher for funds invested in riskier assets, e.g., in stocks rather than bonds, or in emerging market stocks rather than

U.S. stocks. Tracking constraints can alternatively take the form of a bound on the difference between the portfolio weights that a manager gives to asset classes, such as stocks or bonds, or to segments within a class, such as industry-sector portfolios, and the corresponding weights in the benchmark index.

Agency Frictions and Market Anomalies

Momentum and Value Vayanos and Woolley (2013, VW) developed a model that generates the momentum and value anomalies based on the notion that investors move slowly from funds run by underperforming managers to funds run by overperforming ones. Suppose that a negative shock hits the fundamental value of some assets. Funds holding these assets realize low returns, triggering outflows by investors who infer that the managers running these funds have low ability. As a consequence of the outflows, funds sell assets they own, and this depresses further the prices of the assets hit by the original shock. The momentum anomaly arises if the outflows are gradual and if they trigger a gradual price decline and a drop in expected returns. Indeed, the price decline is then associated with low expected returns in the short run. The value anomaly arises because outflows push prices below fundamental values, and so expected returns eventually rise. Indeed, low prices are then associated with high expected returns.[1]

The mechanism generating momentum in VW is non-obvious. Indeed, why do rational investors absorb outflows from underperforming funds, buying assets whose expected returns have decreased? Rational investors in VW buy such assets because of a "bird-in-the-hand" effect. Assets that experience a price drop and are expected to continue underperforming in the short run are those held by investment funds expected to experience outflows. The anticipation of outflows causes these assets to be underpriced and guarantees investors an attractive return (bird in the hand) over a long horizon. Investors could earn an even more attractive return on average (two birds in the bush), by buying these assets after the outflows occur. This exposes them, however, to the risk that the outflows might not occur, in which case the assets would cease to be underpriced.

A simple example illustrates the bird-in-the-hand effect. Suppose that an asset experiences a negative shock to its fundamentals in Period 0. Suppose also that as a result of the shock, the asset is expected to pay 100 in Period 2, and sales of the asset are expected in Period 1. Suppose finally that the asset will trade at 100 in Period 1 if sales do not occur in that period, it will trade at 80 if sales occur, and each sales scenario is equally likely. Buying the asset in Period 0 at 92 earns an investor a two-period expected capital gain of 8. Buying in Period 1 earns an expected capital gain of 20 if sales occur and 0 if they do not. A risk-averse investor might prefer earning 8 rather than 20 or 0 with equal probabilities, even though the expected capital gain between Periods 0 and 1 is negative.

[1] Conditioning on low prices is different than conditioning on a price decline. This is because low prices can arise because of a price decline in the recent past or in the more distant past.

In VW, investors have access to two strategies earning above-market returns. They can pursue momentum strategies, buying assets with high recent performance. They can also pursue value strategies, buying assets that trade at a low price relative to their fundamental value. The optimal weighting of momentum and value strategies changes with the horizon. Short-horizon investors have greater preference for momentum, while long-horizon investors have greater preference for value. This result, shown formally in Polk et al. (2022), can be understood in the previous example. An investor evaluating returns from period 0 to period 1 would not buy the asset in period 0, and would hence not follow a value strategy, because the asset's expected return is negative. Such an investor would instead sell the asset, hence following a momentum strategy. The asset is bought by an investor evaluating returns from period 0 to period 2.

Momentum strategies in VW can be profitable because they exploit gradual flows by performance-chasing investors, effectively front-running these investors. Performance-chasing investors also follow momentum strategies, but these are unprofitable because they trade late in the momentum cycle. They buy when prices are at their peak and sell when prices are at their trough.

Risk-Return Inversion Buffa et al. (2022, BVW) developed a model that generates the beta and volatility anomalies based on tracking constraints. A simple example illustrates the intuition. Suppose that there are ten industry-sector portfolios, out of which five are overvalued with 15% weight in a benchmark index, and five are undervalued with 5% weight. Suppose also that a tracking constraint requires that managers' portfolio weight for each sector does not deviate from the sector's benchmark weight by more than 10%.

Managers give an overvalued sector 5% weight, which is the maximum allowed negative divergence. If the overvalued sector appreciates and reaches 30% weight in the index, then its weight in managers' portfolios reaches (approximately) 10% but must rise further to 20% so that the tracking constraint is met. Managers must thus buy an overvalued sector when it appreciates, which means that they trade overvalued assets procyclically.

A similar argument implies that managers trade undervalued assets countercyclically. Managers give an undervalued sector 15% weight, which is the maximum allowed positive divergence. If that sector appreciates and reaches 10% weight in the index, then its weight in managers' portfolios reaches (approximately) 30% but must drop to 20% so that the tracking constraint is met. Managers must thus sell an undervalued sector when it appreciates.

Procyclical trading of overvalued assets implies that those assets have high volatility. Conversely, countercyclical trading of undervalued assets implies low volatility. Tracking constraints thus generate an inverted relationship between risk and expected return. Overvalued assets have high volatility and low expected return, and undervalued assets have low volatility and high expected return. The inverted risk-return relationship is consistent with the beta and volatility anomalies. According to the beta anomaly (Black, 1972; Black et al., 1972; Baker et al., 2011; Frazzini & Pedersen, 2014), the capital asset pricing model (CAPM) beta has no relationship or an inverted relationship with expected return in the cross-section. According to the

volatility anomaly (Ang et al., 2006), the same is true for the relationship between return volatility and expected return.

The beta and volatility anomalies are at odds with the CAPM and other standard models. One explanation for these anomalies is based on leverage. When investors seek to leverage their exposure to markets, they find borrowing difficult or impracticable, so they choose to do the next best thing, which is buying high-risk assets. Leverage, however, can only explain the flattening of the risk-return relationship and not its inversion. BVW can also explain the inversion.

The procyclical buying of overvalued assets, shown in BVW, would arise even in the absence of explicit tracking constraints. Indeed, asset managers are keen to avoid shortfalls relative to their benchmark index because these convey the impression of incompetence and trigger outflows of capital. Managers' concern about their reputation gives rise to implicit tracking constraints.

Momentum Games Benchmarkers

The theories of momentum, value and risk-return inversion presented in the previous section combine to generate novel implications. VW show that momentum arises because of performance-chasing flows. Such flows arise in VW because investors learn about managers' ability and move from funds run by underperforming managers to funds run by overperforming ones. BVW identify a different source of performance-chasing flows. This is that managers buy overvalued assets when they rise in price, to meet tracking constraints (explicit or implicit). Such procyclical buying contributes to momentum for assets or industry-sector portfolios that are overvalued. Momentum should thus be more pronounced for overvalued assets.

Favilukis and Zhang (2021) provide supporting evidence. They show that momentum profits are significantly higher within the set of stocks that are overvalued, as measured by CAPM alpha.

An additional implication from combining the two theories concerns the identity of those who are on the losing side of the momentum anomaly. Recall that momentum strategies in VW can be profitable because they exploit gradual flows by performance-chasing investors, effectively front-running these investors. The investors who are being front-run are on the losing side of momentum. They buy when prices are at their peak, and sell when prices are at their trough. The losing investors are the late momentum traders and are being front-run by early momentum traders.

The late momentum traders in VW are those who move across funds because of their inferences about managerial ability. BVW's analysis points to a new set of late momentum traders. These are the managers who underweight overvalued assets and are forced by tracking constraints to reduce their underweight when the assets rise in price. BVW's theory implies additionally that managers are more likely to be late momentum traders when their tracking constraints are tighter. Thus, *benchmarking to market indices can both foster momentum and be gamed by it.*

The mechanism is seen most clearly in the stock market where momentum investing has been especially successful. Academic and practitioner research has

repeatedly confirmed not only the presence of momentum in stock returns, but that it obeys a surprising regularity. So much so that researchers can describe the optimal lookback (the period of rising price before purchase) and holding period. Optimal periodicities for both lookback and holding periods are found to be quite stable at 6-8 months over many decades and in most national markets. Momentum traders have been able to make good profits by keeping to fixed periodicities despite this practice being well-known and widely used. No one has been clear who is stuck on the losing side of the trades.

The explanation suggested by VW and BVW points to benchmarked funds as the gullible party. Managers have to demonstrate compliance with tracking error constraints within the annual client reporting cycle. This leads them to rebalance portfolios following strong performance by stocks under-represented there and to do this in time for the annual reports to clients. Momentum traders know that they can enjoy the early stage of the price rises and rely on benchmarkers coming in as buyers at the late stage. Benchmarked funds are the sacrificial counterparties. Without them, momentum traders would struggle to make a living.

Momentum is also present in the price performance of entire asset classes but without the same regularity. Trending is still a powerful force but the durations vary, so that optimal periodicities cannot be established with the same confidence. Nevertheless, momentum investors can still rely on benchmarked funds as late-stage buyers and can exploit this competitive advantage, without being able to milk the relationship so consistently.

The exploitation of benchmarked funds appears to be stepping up to a new level of sophistication. Investing on the basis of computer-driven models has been around for several decades but, until recently, most advances in algorithmic trading have been deployed in intra-day high frequency trading. Now these techniques, including artificial intelligence, are being harnessed to search more widely for opportunities to game the trades of traditional players. These models are predatory, searching markets for predictable and therefore exploitable behaviour. Benchmarked funds, and the second-round responses they promote, are a massive and obvious target.

Rethinking Asset Management Contracts

Benchmarking to market indices is a response by asset owners to the principal-agent problem they face with their asset managers. At the aggregate level, however, benchmarking generates procyclical trading and momentum, exacerbates overvaluation, and distorts the allocation of capital in the economy. Because benchmarking renders asset owners late-momentum investors, it also lowers the returns that they provide to their beneficiaries.

How can the negative effects of benchmarking be mitigated while also addressing the agency frictions in the relationship between asset owners and asset managers? The answer must lie in changes to the practices that owners use to evaluate and compensate managers---including the practice of benchmarking.

Contracts between owners and managers can be evaluated from the viewpoint of private social optimality. The results in BVW suggest that contracts fail to be

socially optimal when taking into account effects on prices and on the allocation of capital in the economy. Contracts may even fail to be privately optimal. Indeed, since asset owners are agents to their ultimate beneficiaries, they want to avoid giving an impression of incompetence, just as managers want to avoid giving such an impression to owners. For that reason, owners may prefer to follow the herd and choose the same contract as other owners, even when an alternative contract yields better results in the long run.

An analysis of privately and socially optimal contracts in asset management is a promising research agenda, which is starting to gather attention (Kashyap et al., 2023). In this section, we present some proposals to improve asset management contracts to achieve the twin goals of reducing mispricing and improving investor returns.

Evaluate Risk and Return Over Longer Horizons Tracking constraints concern the distance between a manager's portfolio and a benchmark index, evaluated over a short horizon. For example, tracking error, the standard deviation of the difference between the return on a manager's portfolio and the return on the benchmark index, is typically computed using daily or weekly returns. The horizon of fund beneficiaries is significantly longer, however. In the case of pension funds, there can be several decades between the time when contributions are made and retirement benefits are paid. Moreover, risk over long horizons can be different than risk over short horizons because returns mean-revert over horizons of a few years or longer.

A similar comment applies to the measurement of performance. An asset manager who trades on the difference between an asset's price and fundamental value may do poorly over a short horizon if the price diverges further away from fundamental value. Over a long horizon, however, the price will approach fundamental value, and performance will be good.

Risk and return should be measured over a longer horizon than is currently done, to better match the horizon of fund beneficiaries. This will reduce price-chasing and incentivize fundamental-based trading. Polk et al. (2022) indeed showed that strategies maximizing a long-horizon Sharpe ratio (expected return divided by standard deviation) give larger weight to value and smaller weight to momentum than strategies maximizing a short-horizon Sharpe ratio.

Implementing long-horizon performance evaluation would require not only changing measures of risk and return, but also changing the timing of manager compensation. Performance fees should only be paid on the basis of long-horizon performance.

Improve Transparency on Choice of Strategy Asset owners should be able to assess whether asset managers invest based on price trends or on fundamental value. Many managers who purport to invest on the basis of fundamentals are often engaging in some degree of price-chasing. Diagnostic tests are needed to assess the validity of managers' claims. Such tests could use data on managers' portfolio policies.

A natural diagnostic test is whether portfolio purchases (sales) occur after prices have been rising (falling), and if so, for how long and to what extent. For example, if a manager frequently adds to positions following a significant rise in the stock price, this would be indicative of price-chasing. If these purchases typically relate to positions that are held at below benchmark weight, this would also suggest that

the manager is seeking to reduce the risk of underperforming the benchmark in the short term. Such tests can better guide asset owners mindful of selecting managers who truly invest based on fundamentals.

Redesign Benchmark Indices Most benchmark indices are broad based and capitalization weighted. This gives rise to procyclical trading by managers who underweight large-capitalization assets in the indices, as shown in BVW. Greater emphasis should be given to indices that account for asset fundamentals in addition to market capitalization. There are different possible designs of such indices. One possibility is that indices weight assets according to measures of cashflow or book value. Such indices are difficult to track, however, because frequent rebalancing is required. Another possibility is that indices exclude a subset of assets whose capitalization is large relative to fundamentals, as is currently done with value indices. A third possibility is that indices are based on the average performance of funds for which the diagnostic test described in the previous paragraph reveals that they invest based on fundamental value.

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