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RECONSIDERING RETURNS

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ABSTRACT

Investors' perception of performance is biased because the relevant measure, returns, is rarely displayed. Major indices ignore dividends thereby underreporting market performance. Newspapers are more pessimistic on ex-dividend days, consistent with mistaking the index for returns. Market betas should track returns, but track prices more than dividends, creating predictable returns. Mutual funds receive inflows for "beating the S&P 500," price index based on net asset value (also not a return). Investors extrapolate market indices, not returns, when forming annual performance expectations. Displaying returns by default would ameliorate these issues, which arise despite high attention and agreement on the appropriate measure.

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There is increasing evidence that the choice of how information is displayed, and other seemingly minor "nudges," can significantly impact people's perception of that information and their resulting behavior (Thaler and Sunstein 2003; Sunstein and Thaler 2003). However, it is typically assumed that such factors do not influence the stock market as a whole. Market selection (Friedman 1953) generally leads investors with correct beliefs to profit and drive out biased investors, leading to prices that reflect more accurate beliefs. When market prices exhibit biases, academics typically ascribe this to causes that do not suggest a strong role for nudges, such as marketwide inattention to the problem, or complexity of the underlying concept. We study the effects of information display in a context that lacks any of these characteristics: the performance of an investor's securities.

Investment performance receives perhaps the most attention of anything in the market. It has an almost universally agreed upon, easily quantifiable definition, namely a return:

$$return_{[t-1,t]} = \frac{p_t - p_{t-1} + d_t}{p_{t-1}}$$

At the risk of belaboring the obvious, an investor's profits come from two sources - the capital gain, or change in price of the asset, and the cash flows, such as dividends or coupons. Outside of complicating factors such as liquidity or tax considerations, these two sources of profit are considered so obviously equivalent that finance academics typically combine them into a single returns variable almost without thought. Implicit in nearly every asset pricing model is the assumption that agents understand and observe performance as returns, a necessary condition to subsequent steps, such as calculating covariances, to value an asset. Of course, asset prices do not reflect the performance measure that investors *should* use, but the one they *actually* use.

We find that the performance information typically displayed differs considerably from economic metrics that best capture an investment's proceeds. Information on returns is rarely displayed by default, and often takes significant effort to find. The discrepancies between how performance should be tracked and what is actually displayed create considerable confusion and practical consequences. They influence how journalists report market performance and how a variety of investors, including CFOs, form expectations of market performance. They affect outcomes as varied as the market betas of portfolios, mutual funds flows and the predictability of market price movements.

We begin with a simple observation - data on returns are not easy to obtain, and are rarely displayed by default. A striking example of this is that most widely reported measures of market performance do not adjust for dividend payments, and display only price changes. This holds for major US stock market indices like the Dow Jones Industrial Average and the S&P 500 index, as well as most commonly reported indices of international markets. The failure of these indices to reinvest dividends causes them to predictably underperform the equivalent return index (which reinvests dividends) when dividends are issued. This underperformance does not contain information (the dividend is announced a number of days prior to the ex-day), but represents a pre-specified ad hoc split of a return into two components, only one of which is displayed to investors. Further, market indices offer a clean test of the impact of information display, because the dividend-induced drop in the index does not correspond to the dividends that most index investors receive, either in amount or timing.[1] While all information necessary to understand returns is publicly available, it seems plausible that most investors do not think or trade in terms of returns if they *never see returns.*

To provide evidence that a significant group of market participants respond to price indices, not total returns, we document confusion as to the nature of market performance in the language of newspaper journalists. We examine the tone of New York Times articles written about the previous day's market performance (used in Garcia 2013), and compare how it varies with past price changes and dividends. While long-term variation in the dividend yield may be related to macroeconomic fundamentals, day-to-day variation in the dividend yield is essentially noise, being largely driven by idiosyncratic variation in firms' ex-dividend dates. If reporters take "the market" to be indices that ignore dividends, they will be more pessimistic on days when dividends cause a mechanical price drop, even though is no economic reason for this behavior. Consistent with this, we find that, for a given level of returns, newspaper coverage is more negative when dividends are higher. Indeed, we

[1] Many investors do not hold the exact market index, and those that do typically hold an ETF or index fund. Investors in passive products do not receive daily dividends, but periodically receive a payout of aggregated dividends (and for index funds, realized capital gains), after subtracting expenses. For individual positions, the influence of display is confounded with psychological factors, such as dividend demand due to the free dividends fallacy (Hartzmark and Solomon 2019).

fail to reject a null that journalists ignore dividends altogether, as would be expected if they only paid attention to the S&P 500 price index.

Next, we consider how erroneous perceptions of annual performance driven by the display of incorrect benchmarks impact the allocation of capital to mutual funds. While some websites, such as Morningstar, compare a fund's returns with returns indices, many, like Yahoo! Finance, compare price changes of funds and indices. We find that flows are discontinuously allocated to funds that "beat the S&P 500" (the price change version), based on their percentage change in Net Asset Value (NAV), rather than the fund's return. Change in NAV is the fund equivalent of a price change, but it fails to correct not only for dividends but also other distributions like realized capital gains and returns of capital. After controlling for many measures of fund performance, funds whose NAV change exceeds the S&P 500 receive additional fund flows of 0.54% per month over the subsequent year. Investors react discontinuously to fund outperformance based on metrics that are popularly disclosed but economically uninformative, consistent with information display affecting flows.

Misperceptions of performance also impact prices. A stock's beta captures how much the stock moves as a function of changes in the overall market. If market performance is perceived to be market price indices, stocks will not have a single covariance with market returns, as they should under standard theories. Rather, stocks will covary more with market-wide price changes than market-wide dividend yields, even though both contribute equally to returns. Empirically, this is the case. All Fama French 25 portfolios sorted on size and book-to-market have a positive beta on the S&P 500 price index after including both the dividend yield and price change. However, for 16 out of 25 Fama French Portfolios, we cannot rule out a beta of zero on the S&P 500 dividend yield. Even when the dividend beta is positive, it is considerably lower than the price change beta - on average the beta on the S&P 500 index is double that of the S&P 500 dividend yield. The lower beta on market dividends implies that the portfolios have time-varying betas on market returns that shift with the uninformative split between dividends and price changes. This is consistent with a neglect of the dividend component of returns, but puzzling under most other theories.

These results are unlikely to be mechanically driven by the distribution of price changes and dividend yields. A simulated placebo dividend yield with the same distribution as market data gives a p-value of 0.0012 of finding such a difference in betas. Further, if the difference in betas for US stocks is due to price indices as measures of market performance, we would not expect the same difference where a price index is not the strong default. We do not find significantly different betas on price changes and dividends when repeating the analysis in the German market, which is unique among developed markets because performance is displayed using a return index.

The market response following index dividends is consistent with investors making a similar mistake to journalists, which suggests that information in prior returns is not being fully incorporated into prices. If the beta on the dividend yield component is too low, higher dividend yields lead to an underreaction to the market returns information that should have been incorporated into prices. This underreaction should lead to positive returns in the future as prices properly reflect fundamentals. Consistent with this, we show that when the dividend yield the previous day was high, the market return is systematically higher. A one standard deviation increased in the dividend yield the prior day is associated with a market return roughly 65% higher than average. No such predictability exists in German market returns. We also expect a cross-sectional effect where high beta stocks underreact to the dividend component of performance more than low beta stocks. We find that, following days with high dividends, high beta stocks perform relatively better compared to low beta stocks, subsuming the betting against beta anomaly.

If daily perceptions of market performance are biased, it is plausible that longer term perceptions are similarly effected, because market performance at any horizon is typically displayed as a price index. To provide evidence consistent with this, we re-examine the finding in Greenwood and Shleifer (2014) that investors extrapolate past market performance, but examine whether investors extrapolate returns, or price indices. Examining a behavioral bias helps to overcome the identification challenge where long term expectations are correlated with macroeconomic variables. Extrapolation is inconsistent with both economic theory and empirical evidence on return predictability, meaning that it likely represents investor biases rather than economic processes. We show that, for a variety of investors including CFOs, extrapolation is driven by past market price changes, with dividends having either zero or negative effects on subjective investor expectations.

This is consistent with market expectations, which are central to many finance questions, being based on the past performance of price indices rather than returns. Price indices historically understate market returns by about 30% per year. The equity premium puzzle, whereby equities outperform bonds by a high margin given their risk, has been the source of much debate in finance. While by no means a full solution, it is less of a puzzle if investors have lower expectations of future market performance because they form them based on price indices rather than on market returns.

To understand the odd choice of information display and construction of market indices, we review the academic literature in finance and economics from the early 20th century when many major market indices were constructed. The consensus that returns are the fundamental measure of performance is actually quite modern. Academic articles from this period generally studied either stock *prices* or dividends. Even when something approximating returns was calculated, authors made various non-standard assumptions, and did not have an agreed term for what they were calculating. The market indices used today were constructed at a time when prices and dividends were considered separate ways to profit from an investment, with the indices designed to capture only the price component. Even though the consensus in favor of returns is more than half a century old, the obsolete and broken index construction persists.

The paper contributes to the literature examining how the display of information can affect investor perceptions and market prices. Related papers include Benartzi and Thaler (1999) and Shaton (2017) who show that the duration of returns displayed leads to different investment choices and impacts marketwide flows.[2] Our results contribute to the literature examining what benchmark investors use to allocate money to mutual funds (e.g. Berk and Van Binsbergen (2016) and Barber et al. (2016)) by demonstrating that a wrongly specified yet commonly displayed benchmark of "beating the S&P 500" is an important component of fund flows. We also contribute to the literature examining the impact of biased expectations on market outcomes (e.g. Greenwood and Shleifer

[2]Other examples include Levi (2016) showing that priming people to view their net worth in terms of potential consumption rather than potential investment value reduces consumption and increases savings. Bazley et al. (2017) shows that color display of past performance impacts decisions. Hartzmark and Sussman (2017) show that the display of sustainability information affects mutual fund flows.

2014, Hartzmark and Shue 2018, Barberis et al. 2015, Barberis et al. 2018). Our paper shows that the performance displayed often differs from the proper benchmark, which impacts perceptions of performance and induces a market-wide impact.

This paper also contributes to the literature on how investors psychologically frame dividends and price changes separately (e.g. Shefrin and Statman 1984). Baker et al. (2007) show that investors treat dividends separately and consume out of them, Di Maggio et al. (2018) show different marginal propensities to consume out of capital gains and dividends, and Baker and Wurgler (2004b) and Baker and Wurgler (2004a) find evidence of time-varying demand for dividends. Hartzmark and Solomon (2019) argue that much of this literature can be explained by investors wrongly viewing dividends as free income disconnected from prices, which they term the free dividends fallacy. While the fallacy seems linked to stable psychological factors, the incorrect display of index information arises for institutional and historical reasons, and likely exacerbates these behavioral issues.

Our results illustrate an extraordinary stickiness in institutional norms. Modern displays of financial performance bear the hallmarks of a confused understanding of finance from a century ago. Indeed, we defy readers to come up with an economic application for which the S&P 500 price index or the Dow Jones *is* the correct metric.[3] The continued popular discussion about movements in the Dow and the S&P 500, when better alternatives are available, is a remarkable example of hysteresis.[4] The behavior we document suggests that inefficient and broken institutions may persist because inattentive agents do not understand how broken they are. Changing to a default display of returns indices is a simple, low-cost policy to ameliorate the distortions we document.

[3]This applies even more so to the Dow Jones, which weights firms by their *share price*, which is entirely arbitrary. From the perspective of modern finance, this is utterly insane. See Shoven and Sialm (2000) for a discussion.

[4]It does not clearly fit the explanations offered for the persistence of inefficient institutions, which involve individually rational behavior aggregating to suboptimal outcomes. These include local interactions (Young 2001), costs (Coate and Morris 1999), network effects (Arthur 1989), or political power (Acemoglu and Robinson 2006).

1 Data

1.1 Return Definitions

In the paper, we reserve the term "return" for the holding period return that includes both price change and dividends, i.e.

$$Return_{[t-1,t]} = \frac{p_t - p_{t-1} + d_t}{p_{t-1}} \tag{1}$$

This can be decomposed into two terms - the (percentage) price change and the dividend yield:

$$PriceChange_{[t-1,t]} = \frac{p_t - p_{t-1}}{p_{t-1}}; \quad DividendYield_{[t-1,t]} = \frac{d_t}{p_{t-1}} \tag{2}$$

Unless otherwise noted, we consider dividend timing based on when the stock goes ex-dividend. For price changes, we adjust for corporate events like stock splits, but do not reinvest dividends. This corresponds to the "returns excluding dividends" variable used by CRSP.

The term "performance" is meant to capture the subjective sense that an investor has about how their trades are doing. This may include returns, price changes (with or without any number of dividend reinvestment strategies), dividends themselves, or some combination of the above. Colloquially, many measures of performance are often referred to as a "return," notwithstanding that they do not correspond to the definition above. When it is necessary to discuss such usages by others which may not conform to our definitions, we use the term "return" in quotation marks.

1.2 Summary Statistics

From 1926 through 2015, Table 1 shows that the average monthly price change on the value weighted market is 0.6% while the average monthly dividend yield is 0.3%, leading to an average monthly return of 0.9%.[5] Figure 1 Panel A graphs the cumulative return to an investment in price changes versus dividend yields, both with monthly reinvestment. Through the 1990s the two were roughly equal, though price changes became a larger component of returns subsequently.

[5]Information about prices, returns, dividends and market-wide indices are all from CRSP.

Panel B illustrates the importance of considering both components of returns together, as well as the importance of reinvesting dividends. The blue line represents the cumulative value of a $1 investment in the CRSP value weighted return index and the red line represents the value of price changes alone. Examining returns, $1 from 1926 was worth roughly $5,000 in 2015, while with price changes alone the $1 grew to roughly $150. The Dow Jones Industrial was about 158 in 1926 and in mid 2016 was about 17,500, but would be closer to 672,000 if it included dividend reinvestment.

The green line represents the value of the investment taking into account the amount of dividends received, but not reinvesting them. All prior dividend values are summed and added to the value of the price change investment. While the green line is above the red line (by construction), it is far closer to the value of the price change investment than to the market investment. In 2015 the cumulative value of this investment was about $200, far below the roughly $5,000 under dividend reinvestment. These figures illustrate why it is important to examine returns rather than price indices. When a dividend is higher, the price level will drop, so examining only the price level mechanically leads to a biased perception of performance. Ignoring reinvestment misses a substantial portion of cumulative market returns.

2 Market Impact of Performance Display

2.1 The Display of Performance Information

One reason to doubt that investors use returns as the measure of performance is that returns are rarely displayed. If investors generally consider performance as returns, it would be puzzling if they preferred to view a different metric as their default display of performance.

Arguably the most discussed number in financial markets is market performance. While academics tend to measure market returns using value-weighted portfolios of the universe of publicly traded stocks, these are not the most commonly quoted measures. Rather, media accounts tend to emphasize indices, such as the S&P 500 and the Dow Jones Industrial Average. Neither of these reinvests dividends, but simply aggregate the price changes of the individual companies.[6] These indices remain the most commonly reported measure of performance at any horizon, and totally ignore the dividend component of performance. While total returns versions of these indices are currently available, they are rarely discussed in media accounts.

Because stock prices predictably drop on ex-dividend days, these price indices are predictably lower on days when their constituent stocks pay dividends.[7] It is unlikely that this is driven by information effects because the index dividend yield is calculated using a stock's ex-day, not a dividend announcement. As a result, any information from any aspect of the dividend was released earlier, and should already be incorporated into prices in an efficient market. The ex-day dividend amount does not have an obvious effect on the information content of the day's returns.

For most of the history of the stock market, total return versions of these indices did not even exist. The Dow Jones industrial average total return index was created in 2012, while the S&P 500 total return index was created in 1988. The equity premium puzzle (Mehra and Prescott (1985)) was written using data through 1978. Over this period, investors forming expectations based on the S&P 500 or the Dow Jones could not have examined a total return version of the index if they wanted to, as such an index did not exist.

The same is true for most major indices for international markets. Table 2 lists 17 country specific indices that are reported daily in the Financial Times, and the type of index that it is. With the exception of Germany and Brazil, the most commonly displayed version of all the market indices are price indices rather than total return indices.[8] Market performance, both in the US and abroad, is typically reported as price changes excluding dividends, not total returns.

In the Appendix, we document that actual returns information is extraordinarily difficult to

[6]See http://us.spindices.com/documents/methodologies/methodology-sp-us-indices.pdf for the S&P 500 index, https://www.djindexes.com/mdsidx/downloads/meth_info/Dow_Jones_Industrial_Average_Methodology.pdf for the Dow Jones Industrial Average. The indices adjust for splits and other corporate events, but not dividends in either case. This conclusion is reinforced by the presence of alternative index products for both companies (introduced at much later dates) that do reinvest dividends.

[7]See, for instance, Elton and Gruber (1970). The stock price usually drops by slightly less than the full amount of the dividend, which is often interpreted as meaning that the marginal investor pays taxes on dividends.

[8]We are not claiming that it is impossible to find total returns, but rather that the main index that investors focus on is typically a price index. For example, the DAX is a return index, but the DAXX price index is also reported. The S&P 500 is a price index, but S&P also reports a total return index, the SP500TR.

find outside of academic databases for individual stock positions. It is not available in any of the brokerage statements we examined (except for Interactive Brokers), not reported on financial websites we examined, and not printed in newspapers. In other words, the difficulty of finding actual returns is widespread across assets, and not limited to market indices (which are the main focus of this paper). The default is overwhelmingly price changes.

As with any information display, sophisticated participants may understand the limitations of the data, and make corrections. We examine whether this occurs, or whether investors treat non-return performance measures as if they were returns. We consider this in how performance is discussed, how capital is allocated, and how securities are priced.

Market indices offer an ideal test of the impact of performance display. The reaction of investors to the performance of individual holdings is influenced by performance display, but also by the psychological framing of different sources of value (Hartzmark and Solomon 2019). This is not the case for market performance, where day-to-day movements in the index do not generally map to dividends the investor receives at that time. It typically takes effort to ascertain precisely what metric is shown, suggesting that investors use the default display of market performance without considering the specifics of the displayed measure. While the psychological framing of dividends may help to explain why some of the default measures are what they are (see Section 3), the responses we document seem best explained by the default display of information. The broken design of major market indices seems to arise primarily for institutional and historical reasons, rather than investors' psychological framing of current performance.

2.2 Framework

Our basic prediction is that investors typically form their conception of performance using the default measure that they see displayed. We predict that they will do so without focusing on the shortcomings of such a measure, and thus will not correct for the idiosyncrasies of the performance measure when they use it. As documented above, in most markets the default display of market performance is a price index that ignores the influence of dividends on performance. Thus, an investor that naively focuses on a price index will predictably underreact to the dividend component of performance when evaluating past performance and when using such information to form expectations of future performance. For example, if there are two days with identical market returns but one of the days is an ex-date for a large dividend and the other is not, such an investor will perceive market performance as worse on the day with the large dividend. This bias occurs because the performance metric they observe displays a lower number on the day with the large dividend than on the day with the same return, but no dividend.

Performance is commonly displayed over various horizons, so to test this idea we need to formalize the question of what horizon of performance measure investors respond to. For example, in its default display of prior market performance, the Wall Street Journal print edition currently reports performance for the past day, past week, past 52 weeks and past 3-year period. Google searches for "S&P 500" currently yields clickable default options of 1 day, 5 days, 1 month, 6 months, YTD, 1 year, 5 year and MAX. Importantly, at every horizon, the number displayed is a price index that ignores dividends. This means that regardless of the horizon an investor views, they are likely to treat the price index as their measure of performance and make the mistake that we are describing.

The fact that the Wall Street Journal and Google display measures of different horizons by default suggests that investors want to use these signals to understand different lengths of past performance. For our paper, we match the horizon of the performance with index movements over that same horizon. So when we conduct tests based on perception of daily performance, we utilize prior daily index movements, and for longer horizon tests we utilize longer horizon benchmarks.

The biased response to index movements at various horizons suggests these may overlap in their influence on the market. The bias in signal due to daily dividends is largely independent across days, as day-to-day variation in dividend amounts does not have much persistence (after controlling for longer term trends). Indeed, the identification offered by this independent variation in daily dividends is why much of the paper's analysis is conducted at the daily horizon. Longer horizon signals are slow moving, as any given day's dividend is a small component of the total dividend over the long horizon being measured. Thus the influence of bias in a long term measure is persistent and represents a slow moving trend. The misreaction to daily dividends likely represents fluctuations around this longer term trend that are largely independent of the long term bias.

Some of the tests in the paper are based on measuring when corrections of this bias are evident in returns. The main prediction that our framework yields is that misreaction to daily dividends should correct over a shorter horizon compared to the misreaction to long term signals. This short term correction need not be to the efficient, fundamental price, but merely to the longer-term trend, whether or not it accurately represents fundamentals. With that said, our framework does not generate specific predictions as to exactly what this timing is, so we leave it as a largely empirical question to be answered.

Our primary concern is identifying a range of evidence consistent with the existence of the base mistake itself. There are a number of other interesting and important questions related to this bias that we leave for future research. We do not explicitly document the mechanism that drives the correction of the bias. If there is a biased signal that garners attention, eventually it is likely that attention is paid to other sources of information revealing the true state, though it is difficult to say specifically what these will be and when they will be paid attention to. We have more specific predictions over what kind of metrics will show more or less evidence of such a mistake. Our intuitive prediction is that mistakes are more likely to be corrected in prices, where profits can be made from trading against mistaken investors, rather than in trades (e.g. fund flows) or individual opinions (e.g. newspaper articles). We also do not identify specifically how erroneous perceptions of performance should be interpreted, such as decompositions into biased perceptions of cash flows versus discount rates. There are a number of ways that the bias could influence investors, and it is likely that there are other ways that this bias influences the market.

2.3 Performance Display and Newspaper Tone

One of the more salient and influential discussions of performance is in the writings of financial journalists. Casual observation suggests that indices like the S&P 500 and the DJIA are quoted in the media, while measures like CRSP value-weighted returns are not. As a result, the market's daily price change is frequently displayed, whereas the daily market total return is considerably less prominent. As shown in Tetlock (2007), Garcia (2013), and Garcia (2014), the tone of articles summarizing financial market news tends to reflect immediate past market performance and predict future market returns. Media coverage matters not just as a proxy for existing events and sentiment, but it also directly affects future stock returns (Solomon 2012) and investor actions (Engelberg and Parsons 2011, Solomon et al. 2014). If journalists are aware of what these indices represent, they should easily undo the effects of dividends not being included. On the other hand, if journalists take indices like the S&P 500 at face value and treat them as measures of performance, the tone of their articles will reflect only market price changes and miss the performance from dividends.

To test this, we take as the dependent variable the measure of New York Times article tone used in Garcia (2013).[9] This takes the New York Times "Financial Markets" columns from 1905 to 2005, and measures tone as the number of positive words minus the number of negative words (as defined by Loughran and McDonald 2011), divided by the total number of words. If journalists only pay attention to price changes, such as the S&P 500, then after controlling for market returns, article tone describing the previous day's events should be more negative following days when the aggregate market dividend yield was higher. We include as independent variables the return on the S&P 500 from the previous day (the total return, not the percentage change in the price index), and the dividend yield on the S&P 500 from the previous day.[10] We also include year fixed effects to control for economic conditions and slow moving trends in the tone of financial markets coverage.

The results are presented Table 3. In column 1, the positive and significant coefficient on the S&P 500 return shows that the better the market performed the previous day, the more positive the news coverage (consistent with prior research). For the dividend yield on the S&P 500, we see a negative and significant coefficient. This indicates that, conditional on the return the prior day, higher dividend yields are associated with more pessimistic tone. The coefficient on dividend

[9]Available on Diego Garcia's website.

[10]The S&P 500 total return index was created in 1988, so to examine the full sample period we use the CRSP value weighted S&P 500 return series and calculate the dividend yield as the difference between this and the CRSP S&P 500 value weighted price index. The correlation between the two total return indices post 1988 is 0.9992 and the correlation between the two price indices is 0.9997.

yield is larger than (and of opposite sign to) the coefficient on the S&P 500 return, and we cannot reject a null hypothesis that the dividend yield coefficient is -0.386 (the opposite of the coefficient on returns), which would correspond to complete neglect of the dividend component. By contrast, we can reject the null that journalists are simply responding to market returns equally regardless of their source, which corresponds to a coefficient of zero on the dividend yield. Column 2 includes dummy variables for each quintile of dividend yield and we see a monotonic relation, with each quintile being larger and more negative than the prior. Columns 1 and 2 include year fixed effects, which will control for different overall levels of dividend yield relating to price levels. However, in order to ensure that our results are not coming from the price component of the dividend yield, in columns 3-6 we replace the variables in question by dividend growth, measured as the day's dividends divided by the average daily dividend amount from 20 days ago to 270 days ago. In other words, we normalize each day's dividends by the average previous dividends, but in a manner that does not require share prices. In columns 5 and 6, we also add year fixed effects. The results are similar to those in columns 1 and 2, indicating that the results are driven by changes in dividends, and not by changes in price levels.

Finally, in Table 3 Panel B, we split the effects based on whether the previous day had positive or negative returns. Garcia (2014) finds that journalists respond in article tone significantly more to past negative returns than positive returns. We replicate this finding in the top row and find that journalists tone responds more strongly to negative news (in Column 3 and 4) than positive news (columns 1 and 2). If this difference is based on an asymmetric response to price indices, this would lead to a greater reaction the dividend component of performance on days with negative news after controlling for returns. Consistent with this, we find that journalists respond more to the previous day's dividends when the previous day had negative returns. This reinforces the idea that the reaction to dividends represents journalists misunderstanding the day's returns, rather than the economic content of dividends, as they also react to dividend-induced price changes in the same asymmetric manner.

These results are consistent with journalists neglecting the dividend component of market returns, and reporting on movements in market price indices. Further, frictions related to dividends such as taxes or trading costs are unlikely to explain the result. Financial journalists are not personally incurring taxes or trading costs with each market movement and are meant to report on the economic content of the day's news, for which the return is the best metric. Even if a reporter wanted to report the after-tax returns to a marginal investor, they would be unlikely to use an index that applies a 100% discount to regular dividends, a 0% discount to special dividends, and a 0% discount to capital gains (realized or unrealized). In other words, the S&P 500 price index does not represent the after-tax or after trading costs position of any realistic group of market participants. Rather, the financial press seems to focus on the most widely reported measures, rather than the most economically sensible ones, when forming their perception of how the market performed on a given day.

2.4 Performance Display and Mutual Fund Flows

We next turn to the question of how the display of performance measures affects investors' allocation of capital. In particular, we examine how investors direct flows to mutual funds based on their performance relative to "the market," broadly defined. This covers both the question of what metric is being used to evaluate the market benchmark, and also what metric is being used to measure the performance of the fund itself. The S&P 500 is the most common index that mutual funds benchmark themselves against, with 44% of funds and 61% of fund assets being benchmarked against the S&P 500 between 1994 and 2004 (Sensoy 2009).

Investors viewing a fund's performance benchmarked to "the S&P 500," are displayed different versions of the S&P 500 in different sources. For example, while Morningstar graphs performance relative to return benchmarks (including the S&P 500 return index), Yahoo! includes only price index benchmarks (including the S&P 500 price index). Different metrics of performance are also used for the fund. While Morningstar displays returns, Yahoo! displays changes in NAV. This fails to correct for *any* distributions, including dividends, realized capital gains, and returns of capital. Figure 2 shows an example from Yahoo!, where the light blue line of the S&P 500 price index is graphed against the dark blue line of the fund's NAV, with the severe drops on the dividend and realized capital gains payment days clearly visible. In other words, the fund's change in NAV is an especially uninformative measure of performance, but is prominently displayed. It is ultimately an empirical question as to what information investors actually use.

To test the impact of such comparisons, we examine whether mutual fund flows respond to a fund outperforming the relatively uninformative S&P 500 price index which does not include dividend reinvestment. We try to isolate the response due to the index itself with the regression:

$$\begin{aligned} Flow_{i,t} &= a + b_1 * NAVBeatS\&pPrc_{i,t} + b_2 * RetBeatS\&pPrc_{i,t} \\ &+ b_3 * RetBeatS\&pRet_{i,t} + b_3 * Controls_{i,t} + e_{i,t} \end{aligned} \tag{3}$$

The dependent variable is the monthly flows to the mutual fund, defined as

$$Flow_{i,t} = \frac{TNA_{i,t} - TNA_{i,t-1} * (1 + R_{i,t})}{TNA_{i,t-1}} \tag{4}$$

where TNA is the fund's total net assets. The three main variables of interest are *NAVBeatS&pPrc, RetBeatS&pPrc* and *RetBeatS&pRet.* These are all dummy variables for whether the fund performance in the previous calendar year exceeds the S&P 500 index over the same period. *NAVBeatS&pPrc* uses the fund's NAV change over the previous calendar year as the metric of performance and compares it to the S&P 500 price index. *RetBeatS&pPrc* compares fund returns to the S&P 500 price index. *RetBeatS&pRet* compares fund returns to the S&P 500 total return index. These allow for different possible benchmarks by which investors may be deciding whether a fund "beat the market." We choose to examine annual changes (e.g. the variable from December 31, 2006 to December 31, 2007 is matched to all monthly observations of fund flows in 2008), as this is how marketing materials are usually quoted and it rules out that more sophisticated investors (e.g. those in Berk and Green 2004) undo such effects in subsequent months. In a univariate setting, each dummy variable captures the difference in flows according to whether the fund beat each S&P 500 benchmark. More importantly, we test whether this difference survives adding many alternative measures of fund performance, captured in *Controls*. These include 72 lags of monthly fund returns, 72 lags of monthly fund returns minus the S&P 500 total return index, 72 lags of squared monthly fund returns, 72 lags of the square of monthly fund returns minus the S&P 500 total return index, 72 lags of the percentile of monthly fund returns, and versions of date fixed effects, date by fund objective fixed effects, and fund fixed effects.[11] If the addition of these permutations of past performance is unable to drive out the effect of the dummy for beating the S&P 500, this suggests that investors are specifically paying attention to whether the fund's returns exceeded the S&P 500 index, not just a general measure of better performance.[12]

These results are represented in Table 4 Panel A. In column 1, beating the S&P 500 price index in terms of NAV shows a strong positive effect on flows, of 1.26% per month with a t-statistic of 13.26 clustered by fund and date. Column 2 controls for the various permutations of 72 lags of monthly returns. These account for roughly half of the Column 1 coefficient, but after they are added, the effect of beating the S&P 500 is equal to 54 b.p. per month in flows, with t-statistic of 10.48. In column 3, beating the S&P 500 price index in terms of returns shows a positive and significant effect on future flows, equal to 25 basis points per month with a t-statistic of 4.61. In column 4, beating the S&P 500 total return index in terms of returns (arguably the most informative specification) has a positive and significant effect on fund flows of 30 b.p., with a t-statistic of 5.84.

However, when we include all three dummy variables (column 5), the effect of outperformance using the least informative measure, NAV over the price index, gets slightly stronger, while the other measures of outperformance become smaller and insignificant. These effects are similar with date fixed effects (column 6) and date by fund objective fixed effects (column 7). Adding both fund and date by objective fixed effects (column 8) reduces the main effect somewhat to 32 b.p. per

[11] We take the metric of market-adjusted performance to be the S&P 500 total return index, so as to ensure that the dummy variables are capturing level differences for outperformance relative to the same set of stocks, rather than differences in the composition of the index itself (e.g. if the S&P 500 were simply a more informative benchmark than the alternative market index). Results are essentially unchanged if we use the CRSP VW index as the equivalent market adjustment for return controls. All returns variables and fund flows are winsorized at the 1% level.

[12] Data run from April 1994 to December 2016. Due to the start of the S&P 500 total return index, and the requirement of six years of lagged returns.

month, with a t-statistic of 5.03. Even with all these additional controls, beating the S&P 500 price index in NAV terms still has a large effect on future fund flows.

To ensure that the results are not due to the particular way we controlled for returns, we consider two non-parametric versions of the above question. In Table 4 Panel B, we use a regression discontinuity design to examine the flows around zero of the fund's NAV minus the S&P 500 price index. This ensures our regressions are not erroneously capturing a non-linearity in the performance/flow relationship. We first regress monthly fund flows on the return controls, plus date fixed effects or date by objective fixed effects and conduct a regression discontinuity test on the residuals. In column 1, with only the return controls orthogonalized, the discontinuity at zero is 0.133% per month, significant at the 1% level. In column 2 and 3 we add date and date by objective fixed effects respectively. The coefficient of 0.132 is similar with date fixed effects, and is slightly larger, 0.175, with date by objective fixed effects, both significant at the 1% level.

As a final check, we take the residuals from the regression that controls for past returns, and average them in bins based on the amount the fund's NAV change exceed the S&P 500. This captures how the effect of beating the S&P 500 varies around zero, discretized into bins. The result, in Figure 3, shows that fund flows jump considerably at just above zero, and the 95% confidence intervals (using standard errors clustered by fund and date) for just below zero and just above zero do not intersect. All 10 of the bins for funds that fell short of the S&P 500 have negative point estimates for flows, and 8 of 10 of these are significant at the 95% level. All 10 of the bins for funds that beat the S&P have positive point estimates of flows, and all 10 are significant.

While taxes and trading costs influence some mutual fund investors, it seems difficult for them to generate the patterns we document.[13] Fund NAVs and the S&P 500 price index do not represent a consistent comparison for tax purposes (or any other purpose for that matter), due to differing treatment of realized capital gains.[14] Discontinuous responses around zero relative to this benchmark are also difficult to explain with rational estimates of skill, trading costs or taxes.

[13]For example Bergstresser and Poterba (2002) finds flows respond to after-tax performance and Sialm and Zhang (2015) finds that taxes affect fund performance more generally.

[14]Implicitly taxing realized capital gains at 100% when using NAV, and 0% in the S&P 500.

These results are consistent with investors responding discontinuously to the idea of "beating the index," even when the index is problematic, and even when the measure of "beating" does not map clearly to either the total return of the fund or the units of index. Discontinuously beating a problematic index is not an important economic metric, but measuring outperformance in terms of NAVs is even less informative. Nonetheless, if returns are not the primary object of observation, then investors may discontinuously care about whether the fund's NAV exceeded the S&P 500 price index. In untabluated results, we find stronger effects for direct sold mutual funds than for broker sold funds, consistent with the mistake being larger at the individual investor level. This reinforces the impact of performance display on investor behavior.[15]

2.5 Performance Display and Stock Betas

If investors' perception of the market is driven by price indices, then this may be evident in stock prices. One place where these differences may be visible is in the market betas of stocks. In a general sense, beta measures how a given stock's return should vary as a function of market performance. As before, this suggests the importance of what investors perceive to be "the market." If the wrong benchmark is used, this may lead to biased reactions for individual stocks.

In particular, consider the standard regression used to measure the CAPM beta:

$$R_{i,t} - R_F = \alpha_i + \beta_i[R_{M,t} - R_F] + \varepsilon_{i,t} \tag{5}$$

Since the return is simply the combination of the percentage price change and dividend yield, $R_{M,t} = PC_{M,t} + DY_{M,t} = \frac{P_{M,t} - P_{M,t-1}}{P_{M,t-1}} + \frac{D_{M,t}}{P_{M,t-1}}$, the regression can be re-written as:

$$R_{i,t} - R_F = \alpha_i + \beta_{i,PC}[PC_{M,t}] + \beta_{i,DY}[DY_{M,t}] - \beta_{i,RF}[R_F] + \varepsilon_{i,t} \tag{6}$$

[15]Seemingly small changes to the nature of the performance measure of fund and index can significantly alter the perception of overall mutual fund skill. Popular discussion tends to focus on what fraction of funds beat the S&P 500. In our sample 37.6% of fund/year observations beat the S&P 500 price index based on NAV changes, 42.1% beat the S&P 500 total return index based on fund returns and 53.3% beat the S&P 500 price index based on fund returns. If beating the index is an economically important benchmark, the metric investors mostly use assigns 62.4% of fund/years as underperforming, thereby incorrectly classifying 3.5% of fund years (or 5.6% of the notionally underperforming sample) when compared to the more informative "returns vs returns" specification.

In other words, the overall beta on market returns can be split into a beta on price change, a beta on the dividend yield and a beta on the risk-free rate.

We take Equation 5 with a single market beta on returns as our null hypothesis. In principle, it is possible to devise a model where investors find a split of price changes and dividends informative, but standard models do not imply this and have not been tested in this manner (e.g. Sharpe 1964, Fama and French 1993, Campbell and Cochrane 1999, Bansal and Yaron 2004). The reason is simple - money is fungible, and investors in a frictionless world have no reason to care about its source. Dividends are announced weeks beforehand, so the split into price changes and dividends is ad hoc, and without information on the ex-day.[16] If a rational investor found such a split informative, then the CAPM and the models that followed should be tested with such a split rather than based on total returns. This is not how these models are tested, because a rational investor should simply examine the total return. The revealed preferences of the profession suggest that Equation 5, arguably the most estimated equation in finance, is the reasonable null, as we are unaware of research allowing for different betas on price changes and dividends.

Under this null, investors care only about the total excess market return as the economic information that day, which means the multivariate betas on the price change and dividend components will be the same (i.e. $\beta_{PC} = \beta_{DY} = \beta_{RF}$). Another way of stating the null hypothesis is that the market beta (at the daily frequency) is not time-varying with respect to the daily dividend yield. The intuition of why the beta coefficients on price changes and dividends should be the same under the null hypothesis is that, conditional on knowing the return, the dividend yield contains no information, but conditional on only knowing the price change, the dividend yield is necessary to understand the return. Thus, a univariate regression of portfolio returns on market dividends can yield a coefficient of zero, but in a multivariate regression including both price changes and the dividend yield, under the null the coefficient on the dividend yield will equal the market beta.[17]

[16]Models of the effect of dividend taxes on returns focus on stock-level dividend yields as drivers of cross-sectional returns, along with market betas (e.g. Brennan 1970, Litzenberger and Ramaswamy 1980). These papers measure market betas with respect to market returns, rather than splitting the return into a dividend yield and a price change.

[17]Further, the beta from the univariate regression of portfolio returns on the market dividends can yield a positive or a negative beta, and under the null hypothesis the coefficient on the dividend yield will equal the market beta.

For example, assume Equation 5 is the true model and that portfolio i has a market beta of 1.2. If there are three observations with a 5% excess market return, the expected excess return on portfolio i on each of the days is 6% (1.2*0.05). Further assume that on these days the market dividend yield was 1%, 1.5% and 0.5%, meaning the percentage excess price change was 4%, 3.5% and 4.5% respectively. Estimating the model using only the excess price change, would yield a beta on the excess price change of 1.5 ($0.06 = \beta\,(0.04)$) in this sample. This gives an unbiased estimate of the portfolio excess returns, 6%, but it has errors that are correlated with the omitted dividend yield. When the dividend yield is 1.5%, the model predicts an excess return of 5.2% ($0.035 * 1.5$), below the 6% expected excess return from the true total returns model. When the dividend yield is 0.5%, the model predicts an excess return of 6.8% ($0.045 * 1.5$), above the 6% expected excess return.

The correlation between the error term from the model using only price changes with the omitted dividend variable means that the model would be improved by including the dividend yield. This is because conditional on knowing price changes, the dividend yield contains information for understanding returns. Thus, in a regression including both price changes and dividends, there will be a positive coefficient on both terms. If the true model is for a market beta on returns, the only model that will yield an equivalent error term in an OLS regression is where the beta coefficients on both terms are equal to the market coefficient.[18]

More formally, assume that the true model is given by $R_i = \alpha + \beta R_M$. Under the null hypothesis, this model yields the best unbiased linear estimator. Further, on two days the same level of returns are observed, $R_M = \overline{R}$. On each day random number z_1 and z_2 are drawn, these are uncorrelated with any error term in the model under the null hypothesis.[19] Moving back to the setting of the paper, the price change on day 1 would be given by $PC_1 = \overline{R} - z_1$ and the dividend would be $DY_1 = z_1$, with the analogous version for day 2. The key assumption is that the z's do not help

[18]If price changes and dividends are linearly dependent, perfectly collinear, there could be other models yielding the best linear unbiased forecast. The model with identical betas equal to the market beta still yields the best linear forecast with collinear regressors, but it need not be unique. Empirically, price changes and dividends are not collinear, so such a case is not relevant for the analysis.

[19]If they were correlated with the error term this would mean they could be included in the regression and improve the forecast. This would violate the null hypothesis as it would mean there was a better linear unbiased estimator.

predict R_i conditional on knowing R_M, $E\left[R_i|\overline{R}\right] = E\left[R_i|\overline{R}, z_t\right] = \beta\overline{R}$. Another way of stating this assumption is that the β coefficient on returns is not time varying as a function of the z terms.

Under these assumptions it must be that $\beta = \beta_{PC} = \beta_{DY}$.[20] To show this, note that $\beta R_M = \beta\overline{R} = \beta\left[PC_1 + DY_1\right] = \beta\left[PC_2 + DY_2\right]$. Allowing for separate coefficients on the price change and the dividend yield, we can re-write the last two terms as $\beta_{PC}PC_1 + \beta_{DY}DY_1 = \beta_{PC}PC_2 + \beta_{DY}DY_2$. Solving for the β_{DY} term yields $\beta_{DY} = \beta_{PC}\frac{(PC_1 - PC_2)}{(DY_2 - DY_1)}$. We know that $\overline{R} = PC_1 + DY_1 = PC_2 + DY_2$, which implies that $\frac{(PC_1 - PC_2)}{(DY_2 - DY_1)} = 1$. Substituting into the prior equation yields $\beta_{DY} = \beta_{PC}$. Finally, we know that $\beta\left[PC_t + DY_t\right] = \beta_{PC}PC_t + \beta_{DY}DY_t$ so it must be that $\beta = \beta_{PC} = \beta_{DY}$.

It is possible for assets to have different betas on price changes and dividends, but this implies that an asset has a market beta that is time-varying according to the dividends accruing to the market that day. This is, not the amount of dividends *announced* that day, which may have information content, but the amount of dividends with an ex-day that day, which was announced a good deal beforehand. Under standard asset pricing theory there is no reason that such a split should be informative. On the other hand, if investors are inattentive to the dividend component, then there may be a lower beta on the dividend yield than on the price change.

To test this hypothesis, we examine whether commonly used portfolios have different betas on market price changes and dividend yields. Because the S&P 500 is one of the most largely followed measure of market performance, we take as independent variables the daily percentage change in the S&P 500 price index, and the value-weighted dividend yield for S&P 500 stocks. As dependent variables, we use daily returns to the Fama French 25 portfolios sorted on size and book-to-market from Ken French's website. For each portfolio i we estimate the regression:

$$R_{i,t} - R_F = \alpha_i + \beta_{i,PC}[PC_{M,t}] + \beta_{i,DY}[DY_{M,t}] - \beta_{i,F}[R_F] + \varepsilon_{i,t} \tag{7}$$

The results are reported in Table 5 in Panel A. For the Fama French 25 portfolios, the average

[20] For the reader inclined to simulation, here is STATA code simulating a market beta of 1.2 and a univariate dividend yield beta of 0: set obs 100000; g MKTret=rnormal(0,1); g FFret=1.2*MKTret+rnormal(0,.1); g MKTdy=rnormal(0,.1); g MKTprc=MKTret-MKTdy; reg FFret MKTdy; reg FFret MKTprc MKTdy;

beta on price changes is 0.882, compared with an average beta of 0.370 for dividend yields. The average portfolio-by-portfolio difference between the two betas is 0.512 with a t-statistic of 8.17, indicating a highly significant difference. All 25 portfolios have positive and significant betas on price changes, compared with only 9 portfolios that have positive and significant betas on dividend yields. For 16 out of the 25 portfolios, we cannot reject the null hypothesis that investors ignore the dividend yield completely and only focus on the price change

If the true model were based on returns, asymptotically the betas on price change and dividend yield would be the same, but the finite sample properties of our regression might make the relation difficult to measure. For example, our regressions might lack power because there is not enough variation in the dividend yield. The distribution of price changes and dividend yields is different, so we wish to make sure that the difference in betas is not mechanically due to the different moments of the variables. To this end, we conduct placebo regressions and find that the finite sample properties of our data are unlikely to drive the results. This is done by preserving the distributional properties of the dividend yield, but constructing a setting where the variable for the dividend amount is different from the actual day's dividends. We take the returns and dividend yields for the S&P 500, but randomly assign the dividend to a different day's return. We compute a pseudo-price change by subtracting the randomly assigned dividend yield from the actual S&P 500 return. In the context of our example, we are drawing z's from a distribution identical to the distribution of dividend yields in our data. The result of this is to produce two variables, both of which add up to the actual day's returns, and which retain the same distribution of dividend yield.

Having obtained the pseudo-price-change and pseudo-dividend for each day in question, we then regress the portfolios on the two components as before, and repeat the process 10,000 times. If our prior results are capturing a statistical artifact of the distributions of the data, the placebo regressions should yield similar results. However, if the prior results are due to investors not fully accounting for the impact of *that day's* dividends on index levels, we would not expect to find different betas on the pseudo price changes and pseudo dividends.

Table 5 Panel B shows that the results are not driven by a mechanical effect from the difference in distributions. The mean difference between the pseudo-price changes and pseudo-dividends is close to zero with a t-statistic of -0.03. In other words, the pseudo dividend yield is equally as informative for portfolio returns as the pseudo price change. This reflects the intuition above - returns are the economic measure of the day's news, and if the return is arbitrarily split into two components, both parts retain the same predicted effect. This reinforces that the difference in betas is not a mechanical artifact of the dividend yield having a different distribution. Instead, the lower dividend betas only apply for *that particular day's dividends,* consistent with dividend neglect. Indeed, when we compare the placebo differences in betas, the value observed in the actual data of 0.512 is higher than all but 12 of the 10,000 simulations and more than twice the value of the 90th percentile of our simulations of 0.217. In other words, the observed data shows a highly unusual difference between the beta on price changes and the beta on dividends. This is consistent with investors focusing on market price indices and thereby paying less attention to market dividends.

One potential concern is that our null hypothesis is incorrect - price dividend ratios predict future market performance, so market betas could vary with dividend yields. Long-term price dividend ratios (typically measured annually) do indeed forecast future market performance over a three to five year horizon (e.g. Cochrane 2011). While daily market dividend yields are a noisy proxy of annual market dividend yields, perhaps the results are capturing such an effect.

While theoretically possible, we empirically show in Panel C this is not the case. The first row re-runs the regressions adding a year by month fixed effect, effectively removing the long-term component of price to dividend ratio. This leaves only within month variation, such as a large company having an ex-dividend day on a Tuesday rather than a Wednesday, which is unlikely to contain economically meaningful content. After including the fixed effects the difference between the price change and dividend beta is 0.692 with a t-statistic of 8.073. Next we add a control for the lagged annual dividend yield and show similar results. Finally, we run the analysis using rolling five year periods which allows for time-variation in market betas. We take the average of the betas for each portfolio and run the t-test on these averages. The third row shows a similar difference with a slightly larger point estimate than the baseline of 0.628 with a t-statistic of 6.89. Thus, the results are not capturing the long-term predictability of returns from price-to-dividend ratios.

Our base analysis examines the full sample period of the S&P 500 and the 25 Fama French portfolios based on size and book-to-market. In Panel C we re-run the analysis on three separate time periods. We find a pairwise difference of 0.532 from 1962-1979, 0.374 from 1980-1998 and 0.811 from 1999-2016, with t-statistics of 7.69, 4.64 and 5.75 respectively. In each sub-period the pairwise difference in coefficients is above 0.38 with t-statistics above 4.6, suggesting the relation has been fairly stable over time. Prior to 1962 the S&P 500 was not the dominant form of performance display (it was created in 1957). To explore this period, we use the Dow Jones Industrial average to measure performance, as to the extent investors during this period focused on market performance (see Section 3), this seems the most likely tool that they used. Examining this period, we find a similar pattern, but a smaller difference in betas of 0.1 with a t-statistic of 1.64. The Dow has significantly fewer stocks (30 firms) so only about 20% of days involve a dividend payout from the index. Empirically, this means the right hand side variable is largely comprised of zeros in our standard analysis. To focus on days with meaningful variation, the next row repeats the analysis on the days where the index paid a dividend. On these days the difference between coefficients is 0.575 with a t-statistic on the difference of 4.08. Thus, even during this early period when there was significant uncertainty as to the concept of performance, market betas respond much more strongly to commonly displayed price indices rather than total returns.

We use the 25 Fama French portfolios based on size and book-to-market as they are arguably the most studied set of portfolios in finance, but in Panel C we explore a number of alternative portfolios and find similar results. We examine portfolios sorts into 6 portfolios and 100 portfolios based on size and book-to-market. Both yield similar point estimates to what we find examining the 25 portfolios. Below we examine five further five by five portfolio sorts including sorts based on profitability and investment. We also examine portfolios sorted on 17, 30 and 48 industries. While there is some variation across all of these different portfolios sorts, in each instance the beta on dividends is significantly below that on the price change.

The main analysis focuses on misreaction to daily dividend yields, as this information is largely random and known ahead of time. With that said, there is no reason why investors responding to longer term measures would not also be prone to such a bias. To examine whether there is empirical support for such a prediction, we re-run the analysis using monthly returns. These results should be interpreted cautiously. Moving from daily to monthly levels means that dividend yields may be more likely to capture longer term economic trends, so we include year fixed effects. Further, the dividend is not known with certainty at the beginning of the month, so the identification is not as clean. At longer horizons it is also less clear what signal an investor is using. At daily horizons investors examining common sources (e.g. the Wall Street Journal), have only the prior day's returns to examine, but a longer horizon offers more options. To the extent we mis-measure the signal used by investors, our results will be biased towards finding the same betas on price changes and dividend yields (as demonstrated by the simulation in Table 5 Panel B). With these caveats in mind, we still find a difference in betas of 0.326. We interpret these results as suggestive that longer term signals also induce a bias, and that this bias is separate from the one induced by daily signals.

Germany offers another interesting placebo test as to whether the different betas that we observe on price changes and dividend yields are due to viewing market performance as a price change index. While most major indices for developed markets are price indices, Germany is an exception as the DAX measures market performance as a total return with dividends reinvested. To the extent that our prior results are capturing investors viewing major market performance based on price indices, we would not expect such an effect for German markets.

We repeat the analysis for the German market in Table 5 Panel D, and find that investors respond to total returns. We examine 16 portfolios formed on size and book to market from 1999-2015.[21] We measure price changes and dividend yields using the CRSP world index for Germany and the risk free rate is measured using the European risk free rate from Ken French's website. For 16 portfolios of German stocks, the average beta on dividend yield (0.603) is actually higher than the average beta on price change (0.54). The pairwise difference is a slightly negative -0.063, though

[21]The data is described in Brückner et al. (2015) and was downloaded from Richard Stehle's website.

insignificant with a t-statistic of -0.852. The difference between the US and Germany is not due to the different time period, as Table 5 Panel C shows a significant difference in the US in this period. The results suggest investors in Germany are responding to total returns, as the betas on the price change component and the dividend yield component are not significantly different.[22]

2.6 Performance Display and Market Predictability

A low beta on the dividend yield is consistent with markets underreacting to the component of returns made up by the dividend yield. In other words, all else equal, if more of the market return comes through dividends there will tend to be underreaction to that component of returns. This suggests that there will be excess returns in the future as the market incorporates this information.

Table 6 Panel A shows results consistent with this - a high dividend yield on the market today predicts higher market returns the next trading day. Column 1 regresses the CRSP value weighted market return today (trading day t) on the dividend yield on the CRSP value weighted market on day t-1. The coefficient is 1.081 with a t-statistic of 3.81. When the dividend yield was high yesterday, the market is predictably higher today. This implies that a one standard deviation increase in the dividend yield (0.00024) is associated with an increase in returns of roughly 2.6 basis points. The unconditional expectation of market returns is 4 basis points, so the market return is 65% higher in expectation after a one standard deviation increase in the dividend yield.

One concern is that the regression is picking up an aspect of market performance the prior day, rather than the dividend yield. Column 2 controls for the prior day's market return and the coefficient on the dividend yield is roughly unchanged at 1.039 with a t-statistic of 3.67. Finally, the regression could be picking up broad periods of time when the market performs well or poorly. To control for this, column 3 includes a year by month fixed effect. If anything, the results are stronger, with a coefficient of 1.406 and a t-statistic of 4.56. Next, we split the sample into days

[22] An additional hypothesis suggested by our analysis is that Germany should have different price and dividend betas (similar to the US) before the DAX was launched in 1987, as the dominant index was the FAZ Aktien price index. Unfortunately we are unaware of a consistent, comprehensive daily data series prior to the DAX to test this hypothesis. See Brückner et al. (2014) and Brückner et al. (2015) for a discussion of the sparseness and unreliability of German daily return data before 1990.

with a negative market return the previous day (column 4) and a positive market return the previous day (column 5). Like in Table 2.3, we find a larger reaction following days with negative returns (coefficient of 2.018, with a t-statistic of 3.84) than following days with a positive return (coefficient of 0.934, with a t-statistic of 2.45). This is consistent with market participants broadly having a similar asymmetric reaction to news as journalists with a stronger reaction to negative news. Next, we examine what speed the market corrects itself, which we consider an empirical question (as discussed in Section 2.2). We explore this in Column 6 by including lagged dividend yield for the prior five trading days. We find that the effect is largest and most significant for the prior day's dividend yield. With that said, there is some evidence of further correction as the dividend yield on day t-3 is also positive and significant, though roughly half of the magnitude. The coefficients on the other lags are largely insignificant. The results suggest that while there may be additional correction at further lags, a significant amount of the correction occurs the day after the ex-date. Thus we focus the majority of our analysis on this day.

As in the tests for journalists, in Panel B we repeat the analysis using dividend growth. If the results were driven not by variation in the dividend yield, but based on discount rate variation through prices leading to predictability, this measure should not capture our effect. Examining Panel B, we find that the results are similar, again suggesting that the effect is coming from the dividend variation itself, and not the price change in the denominator.

To visualize the magnitude, Figure 4 graphs the cumulative return to investing in the market when the prior day's dividend yield was high or low. In Panel A we split the sample based on whether the prior day's dividend yield was above 0.5 basis points. This is slightly above the median value so there are more days in the low dividend category rather than the high dividend category. We cumulate the daily returns when the strategy is in the market with zero returns on other days. From 1962 through 2015, the return to a \$1 investment after high dividend days was \$19.85. For days where the prior day was below that cutoff it was \$9.43, roughly half the high day amount. One concern with a fixed cutoff is that it is capturing slow-moving variation in market returns rather than daily dividend variation. Panel B repeats the analysis splitting within a month based on the median dividend yield that month. The downside to this split is it is not ex-ante tradable as monthly dividend yields are not known until the end of the month. The benefit is that each calendar month has the same number of days in each strategy (with more in the low dividend group if the month has an odd number of days). Thus the graph does not capture slow moving trends. Panel B shows a similar pattern, the high dividend yield line has a final value of $20.52 and the low line has a final value of $9.11.

Germany again offers an interesting alternative arena to examine our hypothesis. If the display of information is responsible for the market predictability in the US, then we would not expect such a pattern in Germany where the major market index displays performance in terms of total returns. Table 6 Panel B repeats the analysis using German market data and finds no effect of yesterday's dividend yield predicting the current day's market return. The coefficients range from roughly 0.11 to 0.23 with t-statistics below 0.50. Thus, in Germany, where market performance is displayed as returns, the prior day's dividend yield does not predict market performance.

2.7 Performance Display and Cross-Sectional Predictability

An underreaction to the dividend component of performance should lead to a differential underreaction within the cross-section of stock returns based on different market betas. A stock, i, with a market beta, β_i, has an expected excess return based on market performance of $\beta_i * ret_{mkt}$. This can be written as $\beta_i * PC_{mkt} + \beta_i * DY_{mkt}$. If market performance is perceived as a price index, the stock will underperform by $-\beta_i * DY_{mkt}$. When looking for the subsequent correction, a high β_i stock will have a larger correction compared to a low β_i stock. To test whether this is the case, we examine the daily portfolios that are long the top decile of stocks based on their beta and short the bottom decile.[23] We regress this portfolio on measures of the dividend the prior day.

Table 7 Panel A shows equal-weighted results. Column 1 regresses the beta difference portfolio on yesterday's dividend yield and a constant, alpha. The alpha in the regression is -0.0248 with a t-statistic of -3.53. This shows that high beta stocks on average underperform low beta stocks

[23] We use annual portfolio sorts and characteristics provided by CRSP for both beta and market cap. Both variables are estimated as of the end of the calendar year and used to sort portfolios and value weight for the subsequent year.

by 2.5 basis points per day, consistent with the prior literature on the slope of the security market line and betting against beta (e.g. Jensen et al. 1972; Frazzini and Pedersen 2014). The coefficient on dividend yield is 1.286 with a t-statistic of 5.09. This indicates that high beta stocks perform relatively better when the dividend yield was higher the prior day. The average difference in betas for stocks in the high relative to the low portfolio is 1.259. This would be the expected coefficient on a subsequent reversal, which is close to the estimate of 1.286.

Column 2, 3 and 4 move from the continuous measure of dividend yield to a discrete measure based on whether the prior day's dividend yield was above 0.5 basis points. Column 2 shows alphas from a CAPM regression, column 3 shows alphas from a four factor regression and column 4 adds interactions of each factor with the dummy variable for a dividend yield above 0.5 basis points the prior day. The interaction term allows for the difference portfolio to have different loadings on factors on days following high dividends. The coefficients on the dummy variable ranges from 2.8 basis points to 3.4 basis points each with a t-statistic greater than 2.74. It is also notable that the point estimate on the high dividend dummy is roughly the same as the negative constant.[24] This means that the CAPM security market line has a negative slope only following days with small dividend yields, and following high dividend yield days the slope is approximately flat.

One possible concern is that this fixed cutoff of 0.5 basis points overweights certain time periods relative to others, thereby conflating a time-series pattern with a cross-sectional one. To address this, in the next three columns the analysis is repeated sorting on whether the day's dividend yield is above the median in that calendar month. Thus every calendar month will have a nearly identical number of observations included and excluded from the dummy variable. With this cutoff, the alphas range from 3.7 to 4.7 basis points with t-statistics above 3.58.

Panel B of Table 7 repeats the analysis value weighted. The point estimates decrease slightly and the t-statistics are smaller, though each is significant at the 10% level and five of the seven are significant at the 5% level. While high beta stocks underperform low beta stocks, our results indicate that this is not the case following days with high market dividends. High beta stocks

[24]We fail to reject that they are the same in absolute value with a p-value on the difference of 0.67.

underreact more to the dividend component of returns, consistent with market participants viewing market performance to be commonly reported price indices, rather than total returns.

While there are aspects of dividend distributions that incur taxes or trading costs, we are not aware of any model of dividend taxes or frictions that generates the time series and cross sectional patterns we observe.[25] For instance, Brennan 1970 and Litzenberger and Ramaswamy 1980 consider the effects of dividend taxes when investors price the after-tax returns for dividend-paying firms, and explore how they relate to the pre-tax returns on the market, which they take as the measure of economic news. By contrast, we examine pre-tax returns of firms, most of whom do not pay dividends on the day in question, on the disaggregated returns of the market. The fact that asset pricing tests are not run in this manner suggests that the division between market price changes and market dividends is not considered a natural or obvious effect of taxes. Nonetheless, it is parsimoniously predicted by the idea that investors are treating the S&P 500 index as the market.

The results suggest that the default display of performance influences marketwide dynamics, including return predictability, the market betas of portfolios and cross-sectional predictability of stocks based on their market betas. While this section has focused on predictions for the market as a whole, Hartzmark and Solomon (2019) explore the implications for individual positions and demonstrate the time-varying impact of viewing price changes and dividends as separate attributes also leads to predictability for individual positions. All of these patterns would be mitigated by viewing performance as total returns, instead of viewing price changes and dividends separately.

2.8 Performance Display and Longer Term Investor Expectations

Up to this point, most of the evidence of market index design mattering has involved short term market movements. The reason is that these tend to be the best-identified, in terms of being unlikely to be explained by longer term macroeconomic shifts, for which there are plausible alternative explanations. But given the ubiquity of the mistaken focus on market price changes, there is no reason to suspect that the impact of bad index design is limited to short term returns. Investors'

[25] Though this does not mean it is impossible to write such a model, of course.

expectations of the equity premium are at the heart of a huge number of asset pricing questions, and the results up to this point raise serious questions as to what numbers investors are actually looking at when considering such questions.

To examine how investors form longer term expectations, we turn to the finding in Greenwood and Shleifer (2014) that investors extrapolate recent market returns when forming expectations of future market returns, even though statistical models and economic theory (e.g. Shiller (1981)) predict that high past returns should negatively predict expected returns. This extrapolative forecasting is not well explained by economic theory, so it presents a good way to test what measure of past market performance investors are using.

Table 8 examines whether investors extrapolate past market returns, or the price indices they actually see reported. We use expectations from the five publicly available surveys examined in Greenwood and Shleifer (2014), namely Gallup, the Graham and Harvey CFO survey, the American Association of Individual Investors, Robert Shiller's survey of individual investors and the Michigan Survey of Consumers. Where possible we update the data through the end of 2018.[26] Each survey contains expectations of future market performance over the subsequent year. We regress these expectations on the price change in the S&P 500, and the dividend yield for the S&P 500, over various past horizons. Panel A takes as dependent variables the price change and dividend yield over the previous quarter, while Panel B examines the same variables over the previous six months.[27]

The results strongly suggest that investors form expectations based on market price indices which exclude dividends, not the correct measure of returns. Over both intervals, for all investor types the prior S&P 500 price change is positively and significantly related to subjective predictions of the chances of the market rising over the next 12 months. By contrast, dividend yields over the same period generally predict negatively in the odd-numbered columns without controls. While this may appear surprising, it is worth noting that the dividend price ratio is negatively related to longer-term

[26]We do so for all surveys other than Gallup, which we take directly from the data appendix of Greenwood and Shleifer (2014). All variables are constructed as described in Greenwood and Shleifer (2014).

[27]As in Greenwood and Shleifer (2014), we are examining monthly data. Returns are matched as of the prior month. For example, for an observation in October 2015, lagged quarterly performance is measured from July 2015 though September 2015 and lagged 6 month performance is measured from April 2015 through September 2015.

market performance, so the negative coefficient likely captures extrapolation of longer-term market trends. To control for such trends, the even-numbered columns include a year fixed effect. In this setup, the variation is coming from within a year after removing the long-term component. After including year fixed effects, the positive coefficient on the market index remains, but the coefficient on the dividend yield moves to roughly zero in most specifications, with 8 of the 10 t-statistics being below 1. The results suggest that the negative explanatory power of dividend yields is mostly capturing general economic conditions, whereas the coefficients on price changes represent investor extrapolation.

Overall, these results are consistent with the idea that investors indeed extrapolate past market performance when forming estimates of future performance, but that past performance is largely viewed as being past price changes. We note that this is true across investor types, including the CFOs in the Graham and Harvey survey. Investors appear to form expectations of the equity premium based on market price indices, not market returns.

At the heart of nearly every asset pricing problem lies expectations of future market risk premium. While well-identified measures of longer-term expectations of market performance for the marginal investor would be ideal, data limitations constrain the ability to provide such estimates. With that said, our paper provides well identified evidence that over short horizons, perceptions of the equity premium are driven by commonly displayed price indices, not market returns. For perceptions of the equity premium for the marginal investor to accurately reflect actual market returns without being influenced by the display of price indices, the following would have to be true:

1. The marginal investor forms expectations of the equity premium based on total returns, even though total return indices for the most commonly reported measures of market performance did not exist for most of the history of the stock market (the S&P total return index was created in 1988, while the Dow Jones total return index was created in 2012).

2. The marginal investor obtains information on recent market returns from data sources other than popular financial websites, newspapers and brokerages, all of whom by default report price indices. Alternatively, such investors face zero incremental costs to seeking out this information on their own, and so are unconcerned that all major data sources generally fail to report this information, even though it would be virtually costless for them to do so.

3. Some explanation other than focusing on price indices explains why there are differences betas on market returns and dividends, and predictability in daily market returns and beta sorted portfolios. Said explanation would also describe why such predictability is absent in Germany, which displays return indices by default.

4. The marginal investor in mutual funds and the marginal investor setting market prices have a different susceptibility to the display of information at the annual horizon. The mutual fund investor compares annual fund performance to the commonly reported price index, but the marginal investor in the equity market views performance in terms of total returns.

5. When extrapolating from past market performance, investors (including CFOs) extrapolate based on the performance of price indices, not on total returns. These investors must not be relevant when considering the perceptions of the marginal investor in the stock market, even though these surveys cover a variety of investor types that each display a consistent pattern.

It is impossible to empirically reject that the marginal investor forms expectations consistent with these conditions, but we feel that the hypothesis that the marginal investor forms expectations at least in part based on the information that they are actually shown (rather than the information they should be shown, but do not see) offers a more parsimonious explanation.

3 A brief history of returns

To many an academic reader who has been taught that returns should be the primary measure of performance for an investor, using or displaying some other crude approximation or disaggregated measure may seem to be an exceedingly naive mistake. To understand its source, we briefly discuss the history of thought on the general concept of performance.[28] Until fairly recently, academic finance was similarly confused with how an investor should view performance. This demonstrates that it is plausible that many investors do not realize that they should be focusing on returns. It also helps one understand the historical legacy of various financial metrics, many of which were standardized prior to the formalized concept of returns, and persist to this day in a similar format.

The modern concept of returns is a surprisingly recent one. In the early 20th century, the quantity under investigation was either "stock prices" or "dividends," but not "stock returns." The

[28]This section summarizes a literature review conducted on early papers on investment performance in the *Quarterly Journal of Economics, Journal of Political Economy, American Economic Review, Journal of Business* and *Journal of Finance* between 1892 and 1960. The papers cited are not meant to be exhaustive, but rather representative of the views we encountered.

terminology and focus very much resembles the argument in Hartzmark and Solomon (2019) that dividends and prices are largely considered as alternative ways to profit from a position. Rarely were the two combined into a single overall profit measure. For example, Hardy (1923) classifies different ways of securing a return on one's capital, and lists as distinct categories:

-"Purchase of securities with a view to obtaining income from interest or dividends"

-"Purchase or sale of securities ... with a view to profit from price changes"

-"Gambling transactions"

These are notably discussed as *alternative* ways to profit, rather than components of a combined profit measure. The category of "gambling transactions," while unusual in a modern taxonomy, was not atypical at the time. Morrison (1949) reviews the history of investment thought up to 1949, and describes how before 1924 it was a serious question whether common stocks were even an investment at all, or whether they were just gambling and speculation. This changed with Smith (1924), who, in the words of Morrison (1949), "revolutionized investment thought" by showing that stocks earned more in total than bonds - in other words, he roughly discovered the equity premium. Smith notes that this fact came as a surprise, and faced strong opposition. For example, Harold (1934) conducted a follow-on study to show that the crash of 1929 did not overturn the finding (which, he claims, was the common conception at the time).

Finding that the price of stocks generally increased over each of the periods studied was sufficiently surprising to Smith that he formulated his "fundamental principle of sound investment"

> *In the selection of securities for investment, we must consider more than the expected income yield upon the amount invested, and may quite properly weight the probability of principal enhancement over a term of years without departing from the most conservative viewpoint.*

While it may seem incredible to a modern reader that it needs to be stated that one should consider both expected capital gains *and* expected income, there did not seem to be a consensus that stock prices warranted consideration as a potentially reliable source of profit.

Smith's analysis, similar to other treatments of the subject at the time (e.g. Fisher 1912), was quite piecemeal. He discussed the "superiority" of stocks by considering income and capital appreciation as separate tests, and the nominal amounts (without reinvestment) were added together. The term "return" is generally paired as "income return" to refer only to dividends and interest, while the returns-analogue he computes is described as the "total advantage of stocks over bonds." The closest to an actual holding period return involves reinvesting only the excess of dividends over bond income in tests labeled as supplementary to the main analysis.

Notably, risk features very little as an explanation of his findings. In ascribing stocks in the long run as having a "definite increase in principal," Smith (1924) argues that common stocks provided *more* safety than bonds, rather than the modern conception of having higher returns due to having higher risk. In the case of Harold (1934), the word "risk" does not even appear in the article.

There were some authors who did compute quantities closer to the modern idea of returns. In our review, Jackson (1928) stands out as the closest approximation to the modern concept of returns, even though the example was not followed in subsequent papers for almost 30 years.[29] He compares the performance of common and preferred stock by computing numbers that are close to the annual holding period returns of each type of stock with annual dividend reinvestment. This exercise was undertaken, he notes, in response other academic positions at the time such as Dewing (1922) that advocated that "[p]referred stocks of all descriptions should be avoided."

Notably, even in articles around this time, the word "return" gets used loosely, and can refer to a wide variety of different concepts related to different ways to profit from an investment.[30] For instance, a number of early papers use "return" to mean something akin to a dividend yield or an income yield (e.g. Scott 1910 and Robinson 1930). Even more oddly to a modern reader, these dividend-yield style "returns" were often quoted as a percentage of the stock's par value, rather than its market value, (as in Mitchell 1910b and Matherly 1923). Sometimes, return refers to any method of profiting from a trade, such as in Hardy (1923). And other times, it seems to refer to something similar to a modern holding period return, as in Jackson (1928).

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[29]The google scholar citation count for the paper as of February 2018 was 9, of which only 3 date from before 1950

[30]Another prominent example is Markowitz (1952), where performance is described as "returns," but the term is not defined. A footnote points readers to 20 pages of Williams (1938) for an example, which focuses on valuing stocks for their dividends, with a separate section (not included in the footnote's page range) discussing speculators valuing stocks for their price changes.

To depict this quantitatively, in Figure 5 we compare the number of articles referring to "stock prices" versus "stock returns" by decade. We examine articles in the *Quarterly Journal of Economics, Journal of Political Economy, American Economic Review, Journal of Business* and *Journal of Finance,* for each decade beginning in 1900. For each of the pairs ({"stock" and "price"} versus {"stock" and "return"}) we consider four variants: if the two words appeared in the title, in the abstract (with data starting in the 1960s), within 10 words of each other in the full text, or as an exact phrase in the full text. We plot the number of "price" entries versus the sum of "price" and "return" entries in each case. No matter which metric is used, the graphs show that the terminology of "stock returns" only become widespread in the 1970s. Indeed, the first article to use the words "stock" and "return" in its title is Dirks (1958). By comparison, there had been 31 articles with "stock" and "price" in their title up to this point. Since the concept of "returns" was historically used loosely, the full text graphs likely *understate* the extent of the change - many of the modern articles referring to "stock prices" in fact exclusively study stock returns, and many of the old references to "returns on stocks" were not about modern returns at all.

Until the late 1950s, authors continued to use different concepts and measures of performance. Academic writing began to converge around the modern idea of returns beginning in the 1960s. Perhaps the most famous formulation which includes both the commonly known formula for returns, and describes it as a return, is in Miller and Modigliani (1961). Foundational to their proof was the concept that an investor could not increase his total return around dividend ex-dates. This forced them to contemplate the two terms together, and the centrality of the paper to future academic finance almost certainly helped popularize the modern returns concept. Meanwhile, the mechanics of how exactly dividends and other distributions were to be treated was examined in considerable detail in Fisher and Lorie (1964) with the development of the CRSP stock returns dataset.

To take one example that illustrates the progression of thought, consider some of the various event study analyses of the effects of stock splits. Dolley (1933) first studies the issue, and examines only price changes, with dividends being ignored altogether. Barker (1956) reconsiders the question, splitting the sample into stocks with and without dividend increases, to focus on how dividend increases may contaminate the news content of stock splits. But even so, the measure of performance is still the percentage price change, ignoring dividends. It is only with Fama et al. (1969) that actual returns are analyzed, using data from the CRSP tapes.

This brief history of investment thought helps to explain the odd way that many stock indices are constructed. Early academic papers which constructed such indices, and companies which did the same, did not think they were constructing indices of *returns*. They thought they were constructing indices of *prices*. Adjustments that seem obvious to a modern finance academic, such as reinvesting dividends, were not nearly so obvious when the subject specifically was prices. This tendency was almost surely exacerbated by the fact that when computations were being done by hand, there was considerable extra work involved to calculate periodic reinvestment values compared with just taking the ratio of starting and ending prices, and dividend information was often difficult to obtain.

These issues can be seen in early academic papers that attempted to construct stock indices. For instance, Mitchell (1910a) not only fails to include dividends, but makes even more odd choices. Stock-level price changes are not even considered in percentage terms. Rather, the first step is to average the price of the stocks in question, and then compute the percentage change in this average. There seems to be no sense that the price level itself is arbitrary, or whether it makes sense to overweight high priced stocks. Incidentally, this seems to be the only semi-plausible explanation for the Dow Jones's "price weighting scheme" - average the price and then compute changes. The continued popular discussion of movements in the Dow, which is utterly unjustifiable as a measure of any economically significant quantity, should be taken as *a fortiori* evidence for the effects we document. Another early attempt at index construction is Cover et al. (1930). The authors adjust for "extra dividends," but not regular dividends.[31] More strikingly, they make a number of other unusual adjustments - subtracting off stock-specific trends in price changes, for instance, and stripping out seasonal variation in prices. While these seem odd if one is computing stock returns, when the object is prices, it is less clear what adjustments should be made. If the mental model is akin to the price of wheat, stripping out a seasonal component is less peculiar.

[31] They acknowledge that they ought to adjust for regular dividends too if they were being careful.

The point of this long discussion is twofold. First, it is important to understand what the state of financial thought was when these indices were constructed. The problem of the curse of knowledge (Camerer et al. 1989) means that modern readers are apt to think that knowledge that we take for granted must have always been obvious. This is simply not so. The Dow Jones Industrial Average was constructed in 1896. The "Composite Index," the precursor to the S&P 500, was constructed in 1923. Both of these occurred before finance had a clear concept of returns.

The fact that these early, naive concepts are still visible and widely quoted a century later shows how sticky institutional norms are. Further, this hysteresis is not easily explained by the theories constructed in other economic arenas. The S&P 500 does not seem to propagate due to local interactions and learning (Young 2001). While some institutions may have made specific investments in the S&P 500 that would be lost under a switch (Coate and Morris 1999), like Standard and Poors themselves or S&P 500 ETFs, this does not easily explain the actions of journalists, individual investors, or data providers who already have access to both price and return indices. There is no political process to capture by investment in political power, as in Acemoglu and Robinson (2006). The closest explanation may be network effects (Arthur 1989), but it is hard to find a co-ordination advantage to some (but not all) data providers displaying fund performance as an NAV, or investors calculating a beta incorrectly, or ignoring dividends leading to predictable market returns. Each of the standard hysteresis explanations is based on individually rational agents interacting to achieve suboptimal aggregate outcomes. The behavior we document is difficult to understand in this manner. Instead, the behavior we observe appears more consistent with investors responding to observed performance without realizing the shortcomings of the measure they are viewing. This suggests that an additional cause of hysteresis may be due to inattention, and simply not realizing that a given measure is not what it claims to be.

The second point of the discussion is to demonstrate the idea of a holding period return is generally less obvious than it may seem to modern academics. Given how long it took academia to coalesce around the idea, it seems likely that many people still think in ill-defined terms about performance, and do not think about how this differs from the appropriate benchmark of returns.

4 Discussion

This paper documents that the most common displays of information related to performance do not reflect the appropriate economic metric of that performance. The fact that it is often difficult to unearth precisely what a performance metric is actually displaying suggests that many investors are not considering the details of the measure they are shown. Given that the cost of changing to the appropriate metric is minimal for both the providers (who have already created better total returns indices) and the investors responding to it (who, with the appropriate measure, would simply need to continue failing to delve into what they were looking at), this is an ideal scenario for a nudge.

The change that would have the greatest impact on shifting investor's perception of performance towards returns is to change the default display of marketwide performance to the already existing total return indices. The transition could be made smoother by normalizing the indices at the same level on a certain date so that investors could retain the same intuition. Further, there likely are some less than scrupulous agents in the market that understand the difference between price changes and returns and use this to frame performance in certain ways that confuse investors who do not understand this difference. Changing the default measure to returns should ameliorate such behavior. The experience in Germany of switching from price indices to the DAX is informative that such a shift is straightforward and not particularly disruptive.

The display of performance of individual positions is a more complex problem. If only returns were displayed, but most investors do not actually reinvest dividends (which is indeed the case - see Baker et al. 2007 and Hartzmark and Solomon 2019, among others) the performance displayed would differ from the total profits the investor actually received. An investor who does not understand what returns represent may become confused that the amount of money in their account does not match the return performance of their investment.

For individual positions in brokerage statements, web portals or newspapers returns could be included in addition to other relevant metrics to avoid confusion. It also would be helpful to investors for brokerages to provide basic information to investors as to what this measure is, how to think about it and what would make it different from the performance of their holdings. In addition to actually understanding the performance of their positions, this may also help investors understand that they are suffering from the free dividends fallacy (Hartzmark and Solomon 2019) and get them to frame performance as total returns instead of price changes and dividends separately. The display of financial performance is an ideal place for a better-chosen default to improve decision-making. Switching to the appropriate benchmark with a little education would likely lead to better decisions, less opportunities for unscrupulous financial advice and a more efficient market at minimal cost.

5 Conclusion

In this paper, we explore the broad impact of a basic stylized fact not widely considered - that the presentation of performance information typically deviates from the economic concept it claims to measure. Across a wide range of sources, we document that investors almost never see returns as the default display of performance. Perhaps the most striking example of this is the fact that most major indices of market performance do not reinvest dividends, and investors seem to be confused about the implications of this. Financial journalists write more negative articles when dividend ex-days cause prices to drop, and important stock portfolios respond strongly in terms of betas to market price changes, but often do not respond to market dividends at all.

The display of performance in terms of price changes, rather than returns with dividend reinvestment, may have a significant impact on investor behavior more generally. For example, if investors view the performance of their investments relative to a price index, rather than a return index, they will not receive feedback that failing to reinvest dividends could lead them to underperform a return benchmark. This could help to explain why investors do not tend to reinvest dividends and view dividends as a free source of income, separate from the price level of the security. If investors view the performance of equities in terms of price indices, they will erroneously perceive less outperformance of stocks relative to bonds. This could partially drive the equity premium puzzle, by increasing the flow of capital to bonds relative to stocks.

Our results show a surprising inattention both by academics and market participants. Either through lack of awareness of the problem, the hassle of collecting data on distributions, or concern for potential confusion by naive investors, many data providers in finance display different performance metrics. Market participants are commonly shown these faulty metrics, and appear to take them at face value, leading to various predictable mistakes. Meanwhile, academics tend to consider the concept of a return so obvious that it is typically taken for granted that everybody else must be tracking the right metrics too. Instead, different groups appear to use the same terminology, but without checking the details of whether others are using the same metrics and definitions.

All of this suggests the market could use a nudge towards the correct display of returns. The results highlight the importance of hysteresis, yet also point to an explanation of the phenomenon that has not been widely considered within economics. In our setting the most likely mechanism does not seem to be individual rationality, but rather inattention to the general phenomenon. It is difficult to think of an application where a price index *is* the appropriate benchmark, so shifting the default display of performance to return indices may lead investors to more accurately perceive performance and make better investor decisions.

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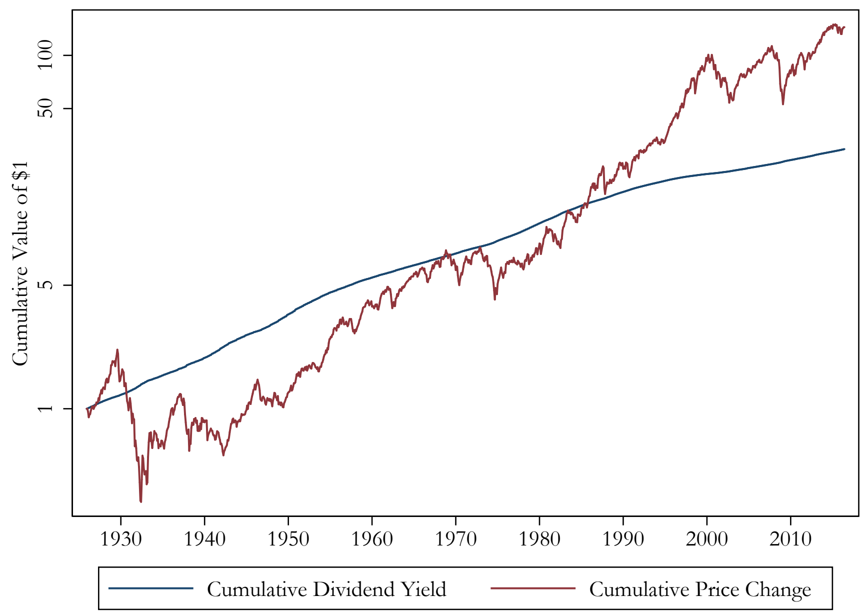
Figure 1
Cumulative Returns to CRSP Value Weighted Index and Dividend Yields

This graph shows the cumulative performance of a $1 investment into various strategies based on the the market return (the CRSP value weighted index, *vwretd*), the market price change (the CRSP value weighted index without dividends, *vwretx*) and the market dividend yield (the dividend yield of the CRSP value weighted index, *vwretd-vwretx*). Panel A shows the cumulative value of $1 invested in only the market price change or only the market dividend yield reinvesting at month end. In Panel B, the navy line shows the cumulative value of $1 invested in market return and the maroon line shows the value based on price changes, both with month-end investment. The green line represents the cumulative value of holding a stock without reinvesting the dividend. The monthly dividend amount is calculated as the prior month-end value of the price change investment times the dividend yield in the subsequent month. Thus the line is the price change value (maroon line) plus the cumulative dividend amount of dividend received from the initial investment at the end of every month, without investing it back into the market.

Panel A: Market Price Change and Market Dividend Yield



Panel B: Market Return and Market Price Change

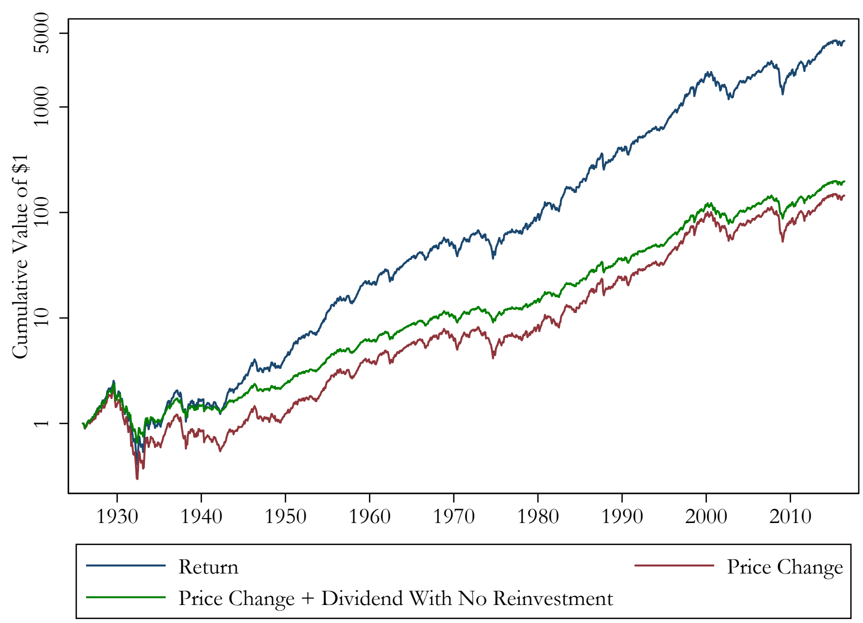


Figure 2

Example Mutual Fund Performance Graph from Yahoo! Finance

This figure displays a screenshot from Yahoo! Finance displaying the prior year's performance of the Fidelity Magellan fund. The dark blue line is the fund's NAV and the light blue line (added by clicking the comparison tab) is the S&P 500 price index.

Figure 3

Non-Parametric Tests of the Effect of Beating the S&P 500 on Fund Flows

This graph shows the monthly residual fund flows that a mutual fund receives according to how close its annual percentage NAV change was relative to the S&P 500 Price index. We begin by regressing monthly fund flows on 72 lags of monthly fund returns, squared returns, and percentile returns. We then take the residuals of this flow regression, and average them into bins of 1% according to the amount by which the fund's NAV change exceeded or fell short of the S&P 500 Price Index over the previous calendar year. To compute standard errors, we regress the fund-month residuals from the initial regression on dummy variables corresponding to these 1% bins, and cluster the standard errors by fund and date. Red bars correspond to residual fund flows when the fund's NAV change was less than the S&P 500, and blue bars are when the fund's NAV change was more than the S&P 500. Grey bars indicate the 95% confidence interval on each of the estimates using the clustered standard errors.

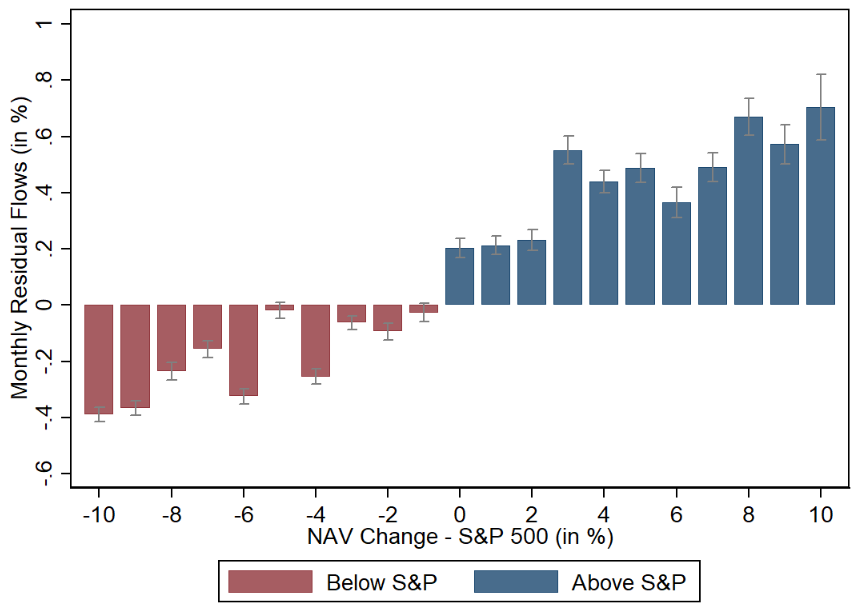
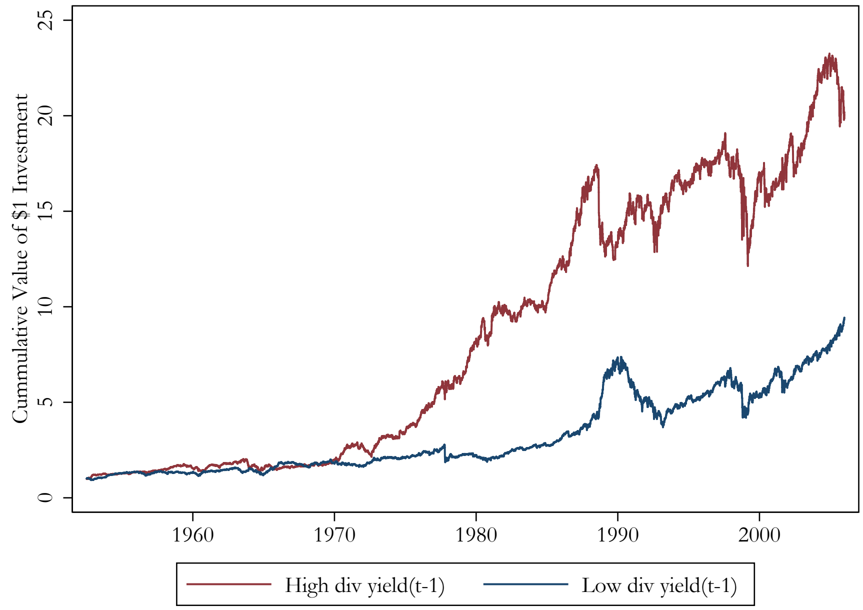


Figure 4

Cumulative Returns to S&P Return Index based on Prior Day Dividend Yield

This graph shows the cumulative performance from holding the S&P 500 value-weighted return index split into two samples of days based on the prior trading day's dividend yield. In Panel A the red line represents the cumulative return to the index on days when the prior day's dividend yield was above 0.5 basis points and the blue line represents the cumulative return to the index on days the prior day's dividend yield was less than or equal to 0.5 basis points. On days when a line is not invested in the market the return is assumed to be 0. Panel B repeats the analysis using the cutoff of being above the median dividend yield in a given calendar month (red line) or less than or equal to the median dividend yield (blue line).

Panel A: High div yield(t-1) is above 0.5 basis points



Panel B: High div yield(t-1) is above monthly median

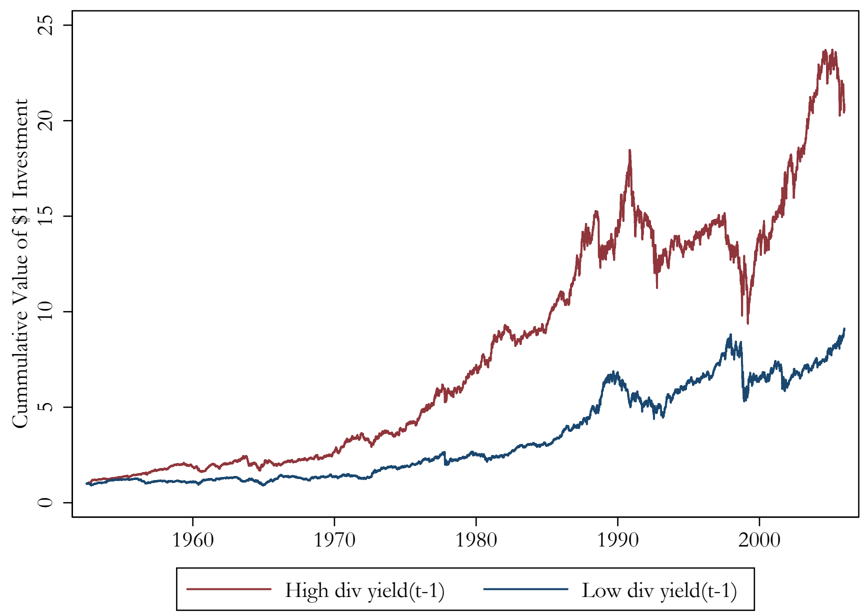


Figure 5

Relative Frequency of Journal Articles on "Stock Prices" versus "Stock Returns"

This graph shows the relative frequency over time of academic journal articles in finance and economics which include terms related to the phrase "stock prices" versus "stock returns". For "price," we compute four different totals - whether "stock" and "price" appear in the title, whether "stock" and "price" appear in the abstract (with abstract information only being widespread starting in the 1960s), whether the full text contains the words "stock" and "price" within ten words of each other, and whether the full text contains the exact phrase "stock price" or "stock prices." We compute analogous measures replacing "price" with "return." For each of the categories, each decade we compute the fraction:

$$\frac{\#Stock\ Price}{\#Stock\ Price + \#Stock\ Return}.$$

We use a search on JSTOR for publications in *American Economic Review, The Journal of Political Economy, The Quarterly Journal of Economics, The Journal of Business,* and *The Journal of Finance.* Counts are generated for each decade ending in the year noted (so "1910" means articles between 1901 and 1910 inclusive, "1920" is 1911 through 1920, etc, with the final incomplete decade being 2011-2017).

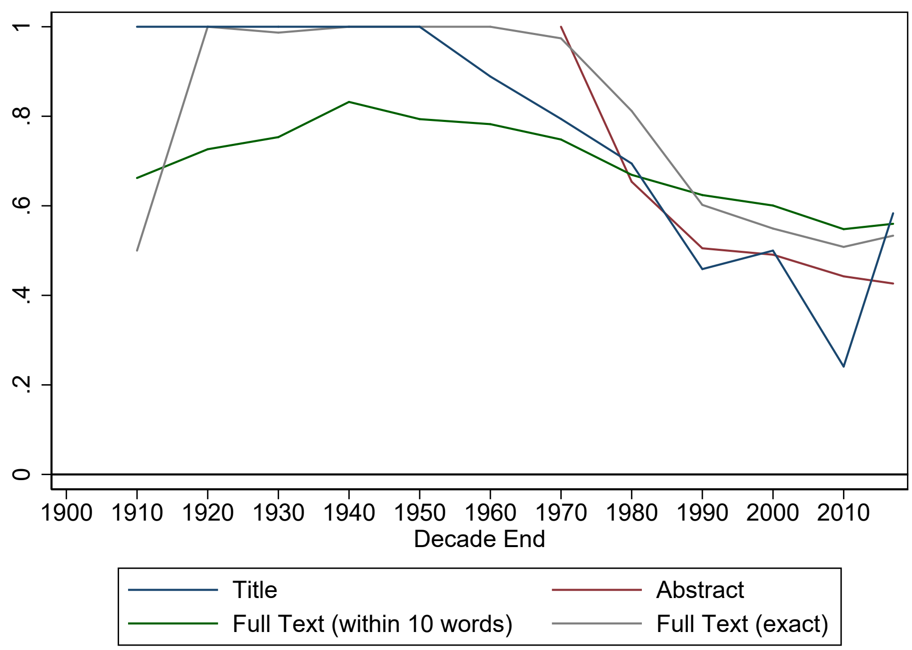


Table 1
Summary Statistics of Price Changes and Dividend Yields

This table displays summary statistics for market price changes and dividend yields. Measures are based on the monthly performance of the CRSP value weighted index. Values are presented as percentages and data cover 1925 through 2015.

	Mean	Std. Dev.	25th Pctile	50th Pctile	75th Pctile	Obs
Price Change	0.604	5.384	-2.136	0.969	3.670	1,080
Dividend Yield	0.313	0.214	0.152	0.231	0.440	1,080
Return	0.917	5.382	-1.835	1.276	3.961	1,080
Corr(PC, DY)	-0.029					

Table 2
Display of Market Performance in Major Country Indices

This table explores the incorporation of dividends in the most common default version of major market-specific equity indices. Indices listed are those that the Financial Times highlights in their market data section as of September 2017. "Return Index" indicates that the measure of market performance reinvests dividends, while "Price Index" indicates that the index does not reinvest dividends.

	Index	Type
Brazil	Bovespa	Return Index
Canada	SP-TSX Comp	Price Index
China	Shanghai Composite	Price Index
France	CAC 40	Price Index
Germany	Xetra Dax	Return Index
Hong Kong	Hang Seng	Price Index
India	BSE Sensex	Price Index
Italy	FTSE MIB	Price Index
Japan	Nikkei 225	Price Index
Korea	Kospi	Price Index
Mexico	IPC	Price Index
Singapore	FTSE Straits Times	Price Index
Spain	IBEX 35	Price Index
United Kingdom	FTSE 100	Price Index
USA	SP 500	Price Index
USA	Nasdaq Composite	Price Index
USA	Dow Jones Industrial	Price Index

Table 3
Newspaper Tone Based on S&P 500 Returns and Dividends

This table examines how the tone of the New York Times financial markets column varies with the returns and dividends of the S&P 500. The dependent variable is taken from Garcia (2013), and computes the number of positive words minus the number of negative words, divided by the total number of words. Positive and negative word classifications are taken from Loughran and McDonald (2011). The independent variables are the value-weighted return on stocks in the S&P 500 from the previous day, and the dividend measure (yield or ratio to past dividend amounts) on S&P 500 stocks on the previous day in columns 1, 3 and 5 of Panel A and in Panel B. In columns 2, 4 and 6 of Panel A dummy variables for each quartile of the S&P 500 dividends (yields or ratios) are included instead (with zero dividend yield omitted). In Panel A Columns 1-2 measure dividends as the value weighted dividend yield. In Panel A Columns 3-6 dividends are measured as the dividend amount divided by the average dividend amount over the prior year (trading days t-20 through t-270). Panel B conducts the analysis separately based on whether the market return the prior day was positive (in Columns 1-2) or negative (Columns 3-4). Fixed effects for each year are indicated in the bottom of Panel A and are included in Panel B. *t*-statistics are in parenthesis. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Including All Days

	Dividend Yield		Dividend Growth			
	(1)	(2)	(3)	(4)	(5)	(6)
SP 500 VW Return	0.386***	0.386***	0.390***	0.389***	0.386***	0.385***
	(43.88)	(43.84)	(42.29)	(42.25)	(43.87)	(43.79)
SP 500 Dividend	-1.137***		-1.223**		-1.304**	
	(-2.92)		(-2.27)		(-2.53)	
First Quartile of Dividend		-0.000474		-0.000395		-0.000521*
		(-1.56)		(-1.24)		(-1.71)
Second Quartile of Dividend		-0.000593*		-0.000433		-0.000580*
		(-1.92)		(-1.34)		(-1.87)
Third Quartile of Dividend		-0.000752**		-0.000599*		-0.000841***
		(-2.41)		(-1.82)		(-2.68)
Fourth Quartile of Dividend		-0.00130***		-0.00107***		-0.00101***
		(-3.88)		(-3.17)		(-3.14)
Year FE	Yes	Yes	No	No	Yes	Yes
R^2	0.223	0.224	0.141	0.141	0.223	0.223
Observations	10945	10945	10945	10945	10945	10945

Panel B: Splitting Based on Sign of Market Return the Prior Day

	Positive Market(t-1)		Negative Market(t-1)	
	(1) Div Yield	(2) Div Growth	(3) Div Yield	(4) Div Growth
SP 500 VW Return	0.158***	0.158***	0.342***	0.343***
	(8.81)	(8.78)	(18.65)	(18.68)
SP 500 Dividend	-0.891*	-1.046	-1.341**	-1.620**
	(-1.76)	(-1.59)	(-2.32)	(-2.06)
R^2	0.112	0.112	0.163	0.163
Observations	5856	5856	5089	5089

Table 4

Fund Flows and Beating the S&P 500 in Returns and Net Asset Values

This table examines whether mutual fund flows respond to beating various forms of the S&P 500 Index, both in terms of the fund's returns and the fund's percentage change in net asset values (NAV), which do not correct for distributions the fund made. In Panel A, the dependent variable is monthly fund flows, the percentage increase in Total Net Assets in excess of the fund's returns over the month. The main independent variables are i) a dummy variable for whether the fund's percentage NAV change exceeded the S&P 500 Price Index in the past calendar year, ii) a dummy variable for whether the fund's percentage NAV change exceeded the S&P 500 Total Return Index in the past calendar year, and iii) a dummy variable for whether the fund's return exceeded the S&P 500 Total Return Index in the past calendar year. 'Ret' controls include 72 lags of monthly fund returns. 'Adj Ret' includes 72 lags of monthly fund returns minus the S&P500 Total Return Index (that is, the level of the difference, not the dummy), 72 lags of squared monthly fund returns, 72 lags of the square of monthly fund returns minus the S&P500 Total Return Index, and 72 lags of the percentile of monthly fund returns. Additional controls include date fixed effects, date by fund objective fixed effects, and fund fixed effects. All returns variables and fund flows are winsorized at the 1% level in each tail. Standard errors are clustered by fund and date. In Panel B, the dependent variable is the residual of fund flows regressed on the controls specified. These residuals are then used for a return discontinuity test around zero, fitting a flexible polynomial function to the level of the fund percentage NAV change minus the S&P 500 Price Index. Data are from April 1994 to December 2016. The top entry in each row is the coefficient, the t-statistic is below in parentheses. *, ** and *** indicate statistical significance at the 10%, 5% and 1% level respectively.

Panel A: Parametric Tests of Beating the S&P 500

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Fund NAV Chg Beat SP 500 (Prc)	1.261***	0.540***			0.576***	0.542***	0.524***	0.317***
	(13.26)	(10.48)			(9.50)	(7.90)	(8.42)	(5.03)
Fund Ret Beat SP 500 (Prc)			0.254***		-0.0926	-0.0797	-0.0971	-0.0984
			(4.61)		(-1.39)	(-1.02)	(-1.36)	(-1.51)
Fund Ret Beat SP 500 (Ret)				0.300***	0.0300	0.0598	0.0192	0.0423
				(5.84)	(0.49)	(0.90)	(0.28)	(0.64)
Ret [m-1, m-72]	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adj Ret [m-1, m-72]	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Date FE	No	No	No	No	No	Yes	Yes	No
Fund FE	No	No	No	No	No	No	Yes	No
Date by Objective FE	No	No	No	No	No	No	No	Yes
R^2	0.00296	0.0195	0.0191	0.0191	0.0195	0.0234	0.0486	0.108
Observations	2273139	1218824	1218824	1218824	1218824	1218824	1218611	1218501

Table 4

(Continued) Fund Flows and Beating the S&P 500 in Returns and Net Asset Values

Panel B: Regression Discontinuity Tests of Beating the S&P 500

	(1)	(2)	(3)
RD for Fund NAV Chg - SP500 (Prc)	0.133***	0.132***	0.175***
	(2.59)	(2.81)	(4.53)
Ret [m-1, m-72]	Yes	Yes	Yes
Adj Ret [m-1, m-72]	Yes	Yes	Yes
Date FE	No	Yes	No
Date by Objective FE	No	No	Yes
Observations	1218824	1218824	1218824

Table 5
Portfolio Betas on S&P Price Change and Dividend Yield

This table examines the betas of stock portfolios on the S&P 500 average percentage price change and the S&P 500 average dividend yield. The stock portfolios are the Fama French 25 portfolios sorted on size and book-to-market. Daily portfolio returns are regressed on both the daily S&P 500 value-weighted average price change and the daily S&P 500 value-average dividend yield (based on ex-dividend days). In Panel A, the "Mean" row gives the average beta for the 25 price change and dividend yield betas, and the difference column shows the average pairwise difference between the two. The "t-stat" is for the test that the pairwise difference is zero. "Num. Positive and Significant" and "Num. Insignificant" refer to the number of betas (out of 25) for the variable in question that are significantly positive, insignificantly different from zero, and significantly negative, respectively. Panel B shows a placebo version of the same regression using a placebo price change and dividend. This takes an actual S&P 500 return and subtracts off an actual S&P 500 dividend yield from a randomly chosen day to create a placebo price change and placebo dividend yield. We then run the same regressions and compute the mean difference and t-statistic, and repeat the simulation 10,000 times. The "Placebo Difference" column shows statistics from the mean difference of the 10,000 simulations while the "Placebo t-stat" column shows the distribution of t-statistics that the differences are zero for each of the 10,000 simulations. The row marked "Num Greater than Data" lists the count of the number of observations out of 10,000 where the simulated value was above what was observed in the data. The remaining rows list the summary statistics indicated in the left hand column. Panel C uses a variety of alternative portfolios and time periods and reports the "Mean" and "t-stat on difference" results for the indicated portfolios. The "Year by Month FE" row includes monthly fixed effects and the "Control for Annual P/D" row includes the lagged prior year dividend yield. The "Rolling Window" row estimates betas for each portfolio each day using the prior 5 years of data. The estimates in this row are averaged for each portfolio and the t-test reports the differences of these averages. The "1926-1961" row uses the Dow Jones Industrial Average and the "Monthly with Year FE" examines monthly data including a year fixed effect. Panel D repeats the analysis from Panel A examining the German market where the major index is the DAX, a return index. The German market price change and dividend are used along with 16 portfolios from the German market sorted by size and book-to-market.

Panel A: Beta Estimates for Fama French 25

	Price Change Beta	Div Yld Beta	Difference
Mean	.882	.37	.512
t-stat on difference			8.17
Num. Positive and Significant	25	9	
Num. Insignificant	0	16	

Panel B: Placebo Estimates Based on 10,000 Simulations

	Placebo Difference	Placebo T-Statistic
Mean	-.001	-.029
Num Greater Than Data	12	119
Min	-.685	-10.837
10th Percentile	-.218	-5.683
25th Percentile	-.114	-3.335
50th Percentile	-.003	-.095
75th Percentile	.112	3.271
90th Percentile	.217	5.703
Max	.624	11.257

Table 5
Continued: Betas on S&P and Dividend Yield

Panel C: US Portfolios using Various Sorts

	Price Change Beta	Div Yld Beta	Difference
Year by Month FE: 5x5 Size and Book-to-Market	.875	.183	.692
	.	.	8.073
Control for Annual P/D: 5x5 Size and Book-to-Market	.882	.310	.572
	.	.	7.901
Rolling Window: 5x5 Size and Book-to-Market	.862	.234	.628
	.	.	6.886
1962-1979: 5x5 Size and Book-to-Market	.917	.384	.532
	.	.	7.685
1980-1998: 5x5 Size and Book-to-Market	.701	.327	.374
	.	.	4.644
1999-2016: 5x5 Size and Book-to-Market	.992	.181	.811
	.	.	5.746
1926-1961: 5x5 Size and Book-to-Market	.881	.730	.092
	.	.	1.64
1926-1961 Non-Zero Div: 5x5 Size and Book-to-Market	.939	.363	.575
	.	.	4.08
2x3 Size and Book-to-Market	.914	.476	.439
	.	.	3.54
10x10 Size and Book-to-Market	.887	.346	.541
	.	.	14.191
5x5 Size and Profitability	.895	.349	.546
	.	.	7.59
5x5 Size and Investment	.887	.352	.535
	.	.	6.966
5x5 Book-to-Market and Profitability	.971	.647	.324
	.	.	5.633
5x5 Book-to-Market and Investment	.942	.655	.287
	.	.	6.595
5x5 Profitability and Investment	.96	.732	.228
	.	.	4.239
5x5 Size and Momentum	.909	.453	.456
	.	.	6.581
5x5 Size and Short-Term Reversal	.91	.414	.496
	.	.	6.66
5x5 Size and Long-Term Reversal	.885	.442	.443
	.	.	6.739
17 Industries	.936	.692	.244
	.	.	3.144
30 Industries	.933	.556	.376
	.	.	5.295
48 Industries	.922	.569	.353
	.	.	5.519
Monthly with Year FE: 5x5 Size and Book-to-Market	1.078	.753	.326
	.	.	1.93

Panel D: Betas on German DAX Return Index

	Price Change Beta	Div Yld Beta	Difference
Mean	.54	.603	-.063
t-stat on difference	.	.	-.852

Table 6
Market Returns Based on Past Day's Dividend Yield

This table examines how the market return varies based on the dividend yield the previous trading day. The market is measured as the CRSP value weighted returns in Panels A and B. Panel A and B examine the USA with Panel A using dividend yield and Panel B examining dividend growth. Panel C repeats the analysis for Germany using dividend yields. Year-by-month fixed effects are indicated at the bottom of the table. *t*-statistics are in parenthese. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel A: USA using Dividend Yield

	All			Mkt [t-1]<=0	Mkt [t-1]>0	All
	(1)	(2)	(3)	(4)	(5)	(6)
Dividend Yield [t-1]	1.081***	1.039***	1.406***	2.018***	0.934**	1.533***
	(3.81)	(3.67)	(4.56)	(3.84)	(2.45)	(4.92)
Mkt [t-1]		0.0681***	0.0227***			0.0231***
		(10.55)	(3.44)			(3.50)
Dividend Yield [t-2]						-0.484
						(-1.55)
Dividend Yield [t-3]						0.808***
						(2.58)
Dividend Yield [t-4]						0.0816
						(0.26)
Dividend Yield [t-5]						-0.399
						(-1.29)
Year Month FE	No	No	Yes	Yes	Yes	Yes
R^2	0.000607	0.00524	0.0500	0.0975	0.100	0.0505
Observations	23910	23910	23910	10803	13106	23906

Panel B: USA using Dividend Growth

	All			Mkt [t-1]<=0	Mkt [t-1]>0	All
	(1)	(2)	(3)	(4)	(5)	(6)
Dividend Yield [t-1]	0.697**	0.682**	0.884**	1.367**	0.524	0.936***
	(2.06)	(2.02)	(2.46)	(2.21)	(1.19)	(2.58)
Mkt [t-1]		0.0686***	0.0232***			0.0232***
		(10.54)	(3.48)			(3.48)
Dividend Yield [t-2]						-0.0905
						(-0.25)
Dividend Yield [t-3]						0.449
						(1.24)
Dividend Yield [t-4]						-0.0182
						(-0.05)
Dividend Yield [t-5]						-0.359
						(-1.01)
Year Month FE	No	No	Yes	Yes	Yes	Yes
R^2	0.000181	0.00488	0.0496	0.0967	0.0995	0.0497
Observations	23515	23515	23515	10628	12887	23511

Panel C: Germany

	(1)	(2)	(3)
Dividend Yield [t-1]	0.226	0.206	0.109
	(0.50)	(0.46)	(0.22)
Mkt [t-1]		0.0274*	-0.0152
		(1.77)	(-0.96)
Year Month FE	No	No	Yes
R^2	0.0000606	0.000812	0.0449
Observations	4171	4171	4171

Table 7

Cross-Sectional Returns by Beta Based on Prior Day's Dividend Yield

This table examines how a portfolio long the highest decile of market beta and short the lowest decile varies based on the dividend yield the previous trading day. Column 1 regresses this value on the prior day's dividend yield and the market return. Column 2, 3 and 4 include a dummy variable equal to one if the prior day's dividend yield was above 0.5 basis points and columns 5, 6 and 7 include a dummy variable equal to one if the prior day was above the median in a month. The coefficients on the dummy variables and alphas are reported in basis points. Columns 1, 2 and 5 include market minus the risk free rate while columns 3 and 6 also include SMB, HML and UMD. Columns 4 and 7 include these variables and also an interaction of them with the dummy variable. *t*-statistics are in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Panel A: Equal Weighted

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dividend Yield[t-1]	1.286***						
	(5.09)						
Div Yld[t-1]>0.5 bp		0.0338***	0.0283***	0.0282***			
		(2.80)	(2.76)	(2.74)			
Div Yld[t-1]>Median					0.0466***	0.0366***	0.0370***
					(3.88)	(3.58)	(3.61)
Alpha	-0.0248***	-0.0244***	-0.0254***	-0.0255***	-0.0289***	-0.0279***	-0.0281***
	(-3.53)	(-2.75)	(-3.37)	(-3.39)	(-3.44)	(-3.91)	(-3.94)
CAPM	Yes	Yes	No	No	Yes	No	No
4-Factor	No	No	Yes	Yes	No	Yes	Yes
Factor Interaction	No	No	No	Yes	No	No	Yes
Observations	24140	24140	24039	24039	24140	24039	24039

Panel B: Value Weighted

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dividend Yield[t-1]	0.869***						
	(3.07)						
Div Yld[t-1]>0.5 bp		0.0301**	0.0250**	0.0256**			
		(2.23)	(1.96)	(2.01)			
Div Yld[t-1]>Median					0.0324**	0.0241*	0.0246*
					(2.41)	(1.90)	(1.93)
Alpha	-0.0264***	-0.0300***	-0.0286***	-0.0291***	-0.0296***	-0.0269***	-0.0270***
	(-3.34)	(-3.03)	(-3.05)	(-3.11)	(-3.14)	(-3.03)	(-3.04)
CAPM	Yes	Yes	No	No	Yes	No	No
4-Factor	No	No	Yes	Yes	No	Yes	Yes
Factor Interaction	No	No	No	Yes	No	No	Yes
Observations	24140	24140	24039	24039	24140	24039	24039

Table 8

Extrapolation of Market Price Change and Dividend Yield

This table examines extrapolation of future market performance based on recent market performance. Regressions include the S&P 500 price index and the dividend yield on the S&P 500 for the prior 3 months in Panel A and prior 6 months in Panel B. The dependent variable is expectations of future market performance from the following surveys: Columns 1 and 2 include data from Gallup from 1996-2011, Columns 3 and 4 include data from the Graham-Harvey CFO survey from 2000-2018, Columns 5 and 6 include data from the American Association of Individual Investors from 1987-2018, Columns 7 and 8 include data from the Shiller survey of Individual investors from 1989-2018, and Columns 9 and 10 include data from the Michigan Survey of Consumers from 2002-2018. Odd columns include calendar year fixed effects. The top entry in each row is the coefficient, the t-statistic is below in parentheses. *, ** and *** indicate statistical significance at the 10%, 5% and 1% level respectively.

Panel A: Prior Quarter Return

	Gallup		Graham-Harvey		AA		Shiller		Michigan	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Lag Price Change	182.3***	110.0***	12.00***	8.994***	0.830***	0.606***	14.35*	7.165**	39.65***	23.83***
	(11.33)	(7.70)	(6.10)	(4.68)	(9.03)	(5.89)	(1.85)	(2.59)	(7.62)	(8.74)
Lag Dividend Yield	-7596.7***	-193.7	-888.1***	-456.3**	-22.18***	0.200	-3604.0***	1.187	-2292.6***	-576.3*
	(-7.02)	(-0.12)	(-6.16)	(-2.21)	(-6.33)	(0.02)	(-6.55)	(0.00)	(-4.71)	(-1.65)
Year FE	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
R^2	0.524	0.769	0.441	0.719	0.214	0.435	0.169	0.927	0.224	0.880
Observations	135	135	70	70	378	378	217	217	199	199

Panel B: Prior 6 Month Return

	Gallup		Graham-Harvey		AA		Shiller		Michigan	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Lag Price Change	148.0***	72.74***	10.74***	5.690***	0.567***	0.319***	18.31***	7.013***	36.64***	17.55***
	(14.57)	(4.86)	(6.87)	(3.42)	(8.47)	(3.04)	(3.24)	(2.71)	(10.64)	(6.65)
Lag Dividend Yield	-3641.2***	947.1	-449.9***	80.99	-10.72***	1.127	-2131.5***	200.3	-1236.0***	-65.22
	(-6.95)	(0.77)	(-5.61)	(0.60)	(-6.04)	(0.15)	(-7.45)	(0.93)	(-6.15)	(-0.34)
Year FE	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
R^2	0.617	0.777	0.427	0.759	0.184	0.399	0.211	0.933	0.282	0.891
Observations	135	135	70	70	378	378	217	217	199	199

Appendix - Evidence of How Performance is Displayed

In this section we document that in many common data sources returns are generally not displayed by default for individual equities.[32]

We first examine various brokerage statements and display the results in Table 9. These statements offer a consistent benchmark as every brokerage routinely provides investors with a statement. We viewed statements from Charles Schwab, Fidelity, Interactive Brokers, Merrill Lynch, TD Ameritrade and Vanguard. With the exception of Interactive Brokers, none of the statements displayed returns. Column 2 shows that all of the statements displayed some version of a price change - either the price change itself, a percentage price change or a change in total value (price multiplied by shares). The next column shows that each statement displayed some dividend information, though, with the exception of Interactive Brokers, this was a short term measure, typically the dividend earned since the last statement, but in a few instances an annual dividend yield. Note that this is not the information necessary to compute the total return, which would be the disaggregated dividends received from a position, as well as the timing of each dividend for reinvestment purposes. The last column indicates that, besides Interactive Brokers, none of these portfolios had this information. Interactive Brokers is the exception, and it is a sufficient rarity that it touts in marketing materials its display of returns as a differentiating feature relative to other brokerages.[33]

As an example, Figure 6 displays portions of Charles Schwab's sample statement. Panel A shows the overall portfolio position section, and Panel B shows the subsequent detail on individual stocks. For both sections there is no returns variable, nor is there enough information to calculate a return. In the overall portfolio section, dividends are combined with interest, but are separate from a "change in value of investments." Dividend information is given for the past year and combined with other quantities. There is no information about reinvestment timing or historical dividends. In the individual stock section, the "gain/loss" is based only on price changes. There is little detail on the historical dividends received, only an ambiguous estimate of *future* dividend income. An investor hoping to calculate a measure of overall returns on their stock would only be able to make a crude approximation requiring manual calculations. While other brokerages differ in the exact manner of

[32] The description is true as of the time of writing, and we have documentation supporting these claims. Given the fluid nature of website design, it is hard to say how long these patterns have been true for, or will be in the future.

[33] Its website claims: "Unlike other systems, we give you the tools and reports you need to focus on your investments" and then lists returns in the list of tools.

what is presented, excepting Interactive Brokers, the pattern is similar, and the conclusion about the difficulty of finding or calculating a return holds for them all.

We also examine a number of sources that display the performance of individual securities. Perhaps the longest consistent time series available is the display of information in newspapers. To examine how this evolved over time, we sampled the Wall Street Journal's reporting of performance of NYSE stocks from 1890 through 2016. Prior to 1928, prices were reported, but there was no dividend information. After 1928 dividends were reported (as the annualized version of the last dividend payment), but separately from price information.[34] While some measures, such as the 52 week high price, are clearly meant to capture past performance, as of today, the Wall Street Journal has never reported a textbook return measure for individual stocks.

Next we examine standard sources of information available online. To keep a consistent benchmark, we examine the landing page from a ticker search for GE, an established, dividend-paying, large cap stock that every site covers. We searched nine financial websites listed in Panel B. In Column 1 we show that none of the websites displayed a total return (with Yahoo! discussed below). All of the websites displayed some information about recent price based performance, and most separately displayed some recent dividend information.

We wish to emphasize that we are not claiming that it is impossible to ascertain a total return, but rather the value is rarely displayed by default. Bloomberg is an interesting example of this, as it likely has a portion of its user base that is more sophisticated than some of the other data providers that we are exploring. When doing a ticker search, the base menu contains various options for research, the most relevant for this paper being the Graph Price function (GP) which yields a line graph of the recent price changes of GE. A more sophisticated investor may be aware of the total returns analysis function (TRA) which displays both the percentage price change and the total return with dividend reinvestment, but this is not one of the default options that appears after a ticker search. Even in Bloomberg, the default from a ticker search is the price change graph, and investors need to actively search out a return measure.

Among the various financial portals that we have examined, even those that do incorporate some sort of "return" measure often do so in ways that are different from the academic measures, and it

[34] E.g., if a firm last paid a quarterly dividend of $1.00, a value of $4.00 was reported, while if a firm last paid a semi-annual dividend of $1.00 a value of $2.00 was reported.

can be difficult to uncover what the measure actually is. For instance, Yahoo! Finance reports a percentage change on their stock summary page without identifying what percentage change this is. Bizarrely, this measure is not the same for all stocks. For NYSE stocks with an ex-dividend day, the measure approximately reinvests dividends, but peculiarly subtracts the dividend from the denominator.[35] For NASDAQ stocks, dividends are not accounted for, and the "percentage change" number is a price change without any dividend adjustment. This fact is not noted on the website, and took considerable investigation to uncover. Given the lack of clarity of what these measures contain, it seems plausible that investors are absorbing what is being presented to them without spending the time to ascertain precisely what measure they are actually observing.

[35] Yahoo! appears to calculate their performance measure for NYSE stocks as: $\frac{p_t-(p_{t-1}-d_t)}{p_{t-1}-d_t} = \frac{(p_t+d_t)-p_{t-1}}{p_{t-1}-d_t}$. Our best guess as to the reason for this strange choice is that it makes the current price and the current "adjusted price" the same number on the current day, though this is purely conjecture.

Figure 6
Example Brokerage Statement Fields from Charles Schwab

These figures present sections of the example brokerage statement provided by Charles Schwab on their website. We have focused on the parts most relevant for an investor trying to calculate the return on stocks in their portfolio. In Panel A, we show a portion of the summary "Change in Account Value" section at the beginning of the statement. In Panel B, we show a portion of the "Investment Detail" section for individual securities.

Panel A: Overall Portfolio Summary

charles SCHWAB

Schwab One® Account of
DANA JONES TTEE
JONES CHARITABLE TRUST
U/A DTD 08/22/1973 FBO R JONES

Change in Account Value	This Period	Year to Date
Starting Value	**$3,295,752.51**	**$3,280,045.42**
Cash Value of Purchases & Sales	(6,814.30)	(75,500.00)
Investments Purchased/Sold	6,814.30	75,500.00
Deposits & Withdrawals	(889.90)	10,102.40
Dividends & Interest[Z]	982.45	5,500.00
Fees & Charges	(70.15)	(384.71)
Transfers	4,480.00	10,580.52
Income Reinvested	(347.97)	(895.65)
Change in Value of Investments	45,927.86	40,886.82
Ending Value on 6/30/2014[Δ]	**$3,345,834.80**	**$3,345,834.80**
Accrued Income[d]	*5,477.94*	
Ending Value with Accrued Income[dΔ]	***$3,351,312.74***	
Total Change in Account Value		
Including Deposits and Withdrawals	$50,082.29	$65,789.38
Including Deposits, Withdrawals, and Accrued Income[d]	*$55,560.23*	

Panel B: Individual Security Detail

Investment Detail — Equities

Equities	Quantity / Units Purchased	Market Price / Cost Per Share	Market Value / Cost Basis	% of Account Assets / Acquired	Unrealized Gain or (Loss)	Estimated Yield / Holding Days	Estimated Annual Income / Holding Period
NATIONAL COMPUTERS[(M)]	**2,000.0000**	**125.3846**	**250,769.20**	**7%**	**52,769.20**	**0.49%**	**100.00**
SYMBOL: NCM	2,000.0000	99.0000	198,000.00	05/20/05	52,769.20	41	Short-Term

Table 9

Display of Dividend and Returns Information on Common Financial Platforms

This table explores the information contained in a brokerage statement as well as that which is displayed in a web search. "Yes" means the source documents the indicated information and "No" means it does not. Return means that the return is displayed. The asterisk on Interactive Brokers is due to their "return" being calculated assuming reinvestment on the payment date. "It's complicated" for Yahoo! is because for NASDAQ stocks price changes are calculated, NYSE stocks include dividends, but also subtract the dividend from the denominator, and their website does not document these facts. "Price/Value change" indicates that the holding period change in price or change in total value (excluding dividends) is displayed. "Dividend [Short Term]" indicates there is dividend information in the report over the recent past, either since the last brokerage statement or in some cases over the prior year. "Dividend [Holding Period]" indicates that the total dividend received since purchase is displayed. In Panel A we examine a brokerage statement from the indicated brokerage. In Panel B we conducted web searches for the ticker "GE" on the indicated financial websites in August 2016.

Panel A: Brokerage Statement

	Return	Price/Value Change	Dividend[Short Term]	Dividend[Holding Period]
Charles Schwab	No	Yes	Yes	No
Fidelity	No	Yes	Yes	No
Interactive Brokers	Yes*	Yes	Yes	Yes
Merril Lynch	No	Yes	Yes	No
TD Ameritrade	No	Yes	Yes	No
Vangaurd	No	Yes	Yes	No

Panel B: Ticker Search

	Return	Price/Value Change	Dividend
CNN Money	No	Yes	Yes
Fidelity	No	Yes	No
Google Finance	No	Yes	Yes
Marketwatch	No	Yes	Yes
Morningstar	No	Yes	Yes
NASDAQ	No	Yes	Yes
NYSE	No	Yes	No
WSJ	No	Yes	Yes
Yahoo Finance	It's Complicated	Yes	Yes