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Have financial markets become more informative?☆

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ABSTRACT

The finance industry has grown, financial markets have become more liquid, information technology has been revolutionized. But have financial market prices become more informative? We derive a welfare-based measure of price informativeness: the predicted variation of future cash flows from current market prices. Since 1960, price informativeness has increased at longer horizons (three to five years). The increase is concentrated among firms with greater institutional ownership and share turnover, firms with options trading, and growth firms. Prices have also become a stronger predictor of investment, and investment a stronger predictor of cash flows. These findings suggest increased revelatory price efficiency.

1. Introduction

Fama (1970, p. 383) writes, "The primary role of the capital market is allocation of ownership of the economy's capital stock. In general terms, the ideal is a market in which prices provide accurate signals for resource allocation: that is, a market in which firms can make production-investment decisions ... under the assumption that security prices at any time 'fully reflect' all available information." Since these words were written, financial markets have been transformed. Information processing costs have plummeted and information availability has vastly expanded. Trading costs have fallen, and liquidity has increased by orders of magnitude. Institutional investing has become dominant, and spending on price discovery has increased.[1] The financial sector's share of output has doubled. To assess whether these changes have brought Fama's ideal closer, in this paper we ask: Have financial market prices become more informative?

To answer this question, we derive a welfare-based measure of price informativeness and then analyze its evolution over time. Using US stock market data from 1960

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[1] Using numbers from French (2008), spending on price discovery has risen from 0.3% to 1% of gross domestic product since 1980.

to 2014, we find that among comparable firms price informativeness has increased substantially at medium and long horizons (three to five years) while remaining relatively stable at short horizons (one year). Results from a variety of tests support the interpretation that the rise in price informativeness is due to greater information production in financial markets. Under this interpretation, rising price informativeness has contributed to an increase in the efficiency of capital allocation in the economy.

We use a simple framework to derive a welfare-based measure of informativeness and generate testable predictions. Standard q-theory (Tobin, 1969) implies that investment is proportional to the conditional expectation of future cash flows, making firm value convex in this expectation. Intuitively, investment is an option on information, and firm value embeds the value of this option. It follows that aggregate efficiency is increasing in information (Hayek, 1945), which can be quantified by the predicted variance of future cash flows (i.e., the variance of their conditional expectation). We are particularly interested in the information content of prices, which is given by the predicted variance of cash flows using market prices as the conditioning variable. Our price informativeness measure is its square root.

We construct time series of price informativeness from yearly cross-sectional regressions of future earnings on current stock market valuation ratios (we also include current earnings and sector controls). We focus on the one-, three-, and five-year forecasting horizons and on Standard & Poor's (S&P) 500 firms whose stable characteristics allow for a fairly clean comparison over time.

Price informativeness is increasing with horizon, consistent with prices capturing differences in growth rates between firms. Moreover, current earnings are already a good predictor of next year's earnings, making prices more useful at longer horizon. From a capital allocation perspective, the longer horizons are particularly important, as the time-to-build literature suggests that investment plans take over a year to implement, with the cash flows materializing farther down the road.

Our key result is that price informativeness has increased substantially at the three- and five-year horizons. The upward trend is steady throughout the 50-year sample, and its cumulative impact is economically significant: price informativeness is 60% higher in 2010 than 1960 at the three-year horizon and 80% higher at the five-year horizon. The increase is also highly statistically significant. Price informativeness at the one-year horizon, which is smaller to begin with, shows only a modest increase.[2]

[2] For completeness, we also calculate price informativeness for firms beyond the S&P 500. We stress, however, that the composition of this sample has changed dramatically over the years (see Fama and French, 2004), making the comparison potentially misleading. This is readily apparent from trends in observable characteristics such as idiosyncratic volatility and earnings dispersion (measures of uncertainty), which have risen drastically. By contrast, these characteristics are remarkably stable for S&P 500 firms. Likely as a result of the compositional shift, price informativeness for firms beyond the S&P 500 appears to decline. Interestingly, the decline is concentrated at the short horizon, so again there is relative improvement at the long end. Above all, we view these results as motivating our focus on S&P 500 firms.

The increase in price informativeness is not explained by changes in return predictability. Because valuations are driven by either cash flows or expected returns (Campbell and Shiller, 1988), a decrease in cross-sectional return predictability (e.g., a drop in the value premium) could make price informativeness rise even if information production does not. We find that this is not the case by putting returns on the left side of our forecasting regressions, which shows that the predictable component of returns remains stable.

Theory suggests that the information contained in market prices for future earnings should also be reflected in investment decisions. We therefore look at the predicted variance of investment based on market prices. We find that market prices have become stronger predictors of investment as measured by research and development (R&D) spending though not capital expenditure (CAPX). Thus, when it comes to real decisions like R&D for which market information is arguably particularly useful, the information content of prices has also increased.

More informative prices do not necessarily imply that financial markets have generated an improvement in welfare. Market prices contain information produced independently by investors, as well as information disclosed by firms. It is the independent, market-based component of price informativeness that contributes to the efficiency of capital allocation. Bond, Edmans, and Goldstein (2012) call this component revelatory price efficiency (RPE), in contrast to forecasting price efficiency (FPE), which also includes information already known to decision makers inside the firm.

Although separating FPE and RPE is challenging, we can use our theoretical framework to guide our analysis. In our framework, managers have access to internal information, some of which they disclose to the market. Investors combine this disclosure with their own independent information to trade, and this causes prices to incorporate both types of information (FPE). Managers then filter out as much of the independent information contained in prices as they can (RPE) and combine it with their own internal information to set investment optimally (aggregate efficiency). The rich two-way feedback between firms and markets in our framework ensures that the predictions we formulate and test are robust to a wide range of models proposed in the literature.

Our framework shows that an increase in market-based information (RPE) can be distinguished from a pure increase in firm disclosure by looking at aggregate efficiency, the predicted variation of future cash flows based on the manager's full information set. All else equal, an increase in disclosure causes aggregate efficiency to remain the same even as price informativeness (FPE) rises. Although the manager's information set is not observed, it gets reflected in her investment decisions. We show that we can bound aggregate efficiency from below by the predicted variation of future cash flows from investment and from above by the cross-sectional dispersion of investment, both of which are increasing in the amount of information the manager has. Measuring investment as either R&D alone or R&D and CAPX together, we find evidence that the predicted variation of earnings from investment has