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Beliefs-driven price association



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ABSTRACT

In addition to being a function of traditional fundamentals such as cash-flow persistence and the discount rate, the equilibrium association between a security price and a value-relevant statistic can simply be a function of what rational investors believe the association will be. We refer to this phenomenon as beliefs-driven price association (BPA). By explicitly considering the phenomenon of BPA, we show that the price response to information releases can vary over time even if the risk-free interest rate and investor preferences are static and the earnings/cash flow generating process is stable. This observation suggests, for example, that price-to-earnings associations and price volatility can vary over time even if a stable pattern of economic fundamentals suggests otherwise. The possibility of BPA suggests that measures of the cost of capital, information content, and growth prospects inferred from observed market prices will be confounded. While we do not predict when periods of BPA will arise, we provide empirically testable predictions about how prices should behave during periods of BPA. In particular, we predict that, during sufficiently long periods of high (positive or negative) BPA, price volatility, price levels, and expected returns will be higher than would be implied by a fundamental valuation framework. Finally, while BPA in the pricing of one security does not cause BPA in the pricing of other securities, the price levels of those other securities will be affected if the securities with BPA are sufficiently large relative to the market as a whole.

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1. Introduction

The association between earnings and prices in traditional equity valuation models is a function of discount rates as well as the growth and persistence of earnings.¹ We posit another determinant of the association between earnings, or some other value-relevant statistic, and price: higher order beliefs or beliefs-about-beliefs. Our analysis stems from Keynes' observation that investors will attempt to predict future beliefs about a firm's equity value, as opposed to predicting future cash flows, because equity price is determined by beliefs. As a consequence, beliefs-about-beliefs – and not beliefs about cash flows – may drive firm share prices. Various theoretical analyses have demonstrated that beliefs-about-beliefs can foster deviations of price from fundamental value, where fundamental value is the risk-adjusted present value of expected future cash flows. In particular, higher order beliefs can lead to pricing bubbles in which share prices rise temporarily above fundamental value.² We extend those prior analyses by considering a setting in which higher order beliefs about the

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E-mail addresses: pef@wharton.upenn.edu (P.E. Fischer), miheinle@wharton.upenn.edu (M.S. Heinle), verrecch@wharton.upenn.edu (R.E. Verrecchia).¹ See, for example, Kormendi and Lipe (1987).² See, for example, Abreu and Brunnermeier (2003), Azariadis (1981), and Tirole (1985).

Notation		α_t	intercept term in price at time- t
		Δ	first-moment drift parameter
ε_t	earnings/cash-flows at time- t	β_t	price association at time- t
η_t	earnings/cash-flow innovation at time- t	δ	degree of BPA
λ	persistence of earnings	q	demand in the asset's shares
v	variance of earnings innovation	γ	shares of asset 1 per capita
r	risk free return	c	covariance between η_{1t} and η_{2t}
ρ	coefficient of constant absolute risk aversion		

association between earnings and price can support an equilibrium association that differs from the association predicted by a traditional equity valuation framework. We call this phenomenon “beliefs-driven price association.”

To illustrate the role of higher order beliefs in determining the association between prices and value-relevant statistics such as earnings, we employ a simple overlapping generations (OLG) model.³ Identical investors with constant absolute risk aversion (CARA) utility functions live for two periods. These investors are savers (buyers) in the first period of life and consumers (sellers) in the second period of life. The investment opportunity set includes a risky asset that generates stochastic earnings each period. We assume earnings are paid out as dividends and follow a simple, one-period, auto-regressive time series process. Within the context of this model, the only news that arrives each period is earnings information.

To establish a benchmark, we characterize a steady-state linear equilibrium where the intercept and coefficient on earnings are the same at each point in time. This equilibrium characterization, which is common in the literature, is consistent with a fundamental valuation in that price equals the risk adjusted present value of future cash flows. Furthermore, the fact that the intercept and coefficient are stable over time is consistent with the stable earnings process that determines the valuation.

We depart from the literature by allowing the possibility of linear equilibria where the coefficient on earnings varies over time. To do so, we consider how current period investors price the risky asset if they believe that investors in subsequent periods will place too much (or too little) emphasis on subsequent period's earnings when pricing the risky asset. We find that these beliefs cause current period investors to rationally place a greater (lesser) emphasis on current earnings when pricing the risky asset, which implies a beliefs-driven price association (BPA). As a consequence, rational expectations equilibrium price paths can exhibit greater (or lower) associations between a value-relevant statistic and price than is implied by a fundamental valuation.

Our central contribution is to establish that higher order beliefs directly determine the association between disclosed information and price. As a consequence, BPA equilibria can arise where the price association deviates from the association predicted by a fundamental valuation model. Our analysis of BPA pricing paths suggests that the extent of BPA can vary over time, with periods of, say, high BPA followed by periods of lower or no BPA. During periods of high BPA, (i) the cost of capital inferred from the relation between price and earnings would appear to be low even though the cost of capital is high; (ii) price would appear to be more informed by earnings news, even though that news conveys the same information about future cash flows; (iii) growth prospects inferred from a price multiple would be high even though growth prospects are, say, average; and (iv) price will be more volatile than a fundamental valuation framework would suggest. Finally, if the variability associated with BPA is priced, higher expected returns are predicted for periods of BPA than for periods in which prices reflect steady-state fundamental valuations.

There is a long history of accounting literature regarding the notion that economic agents place undue, or disproportionate, emphasis on accounting information (see, for example, Ashton, 1976; Hand, 1990; Ijiri et al., 1966; Sloan, 1996). Much of this literature has alluded to bounds on cognitive capabilities, such as limited attention. For example, Bloomfield (2002) and Hirshleifer and Teoh (2003) discuss how limited attention and the nature of disclosure can jointly cause prices to overweight some statistics and underweight others. In a somewhat similar vein, Huddart et al. (2009) provide evidence that some investors fixate on firms whose prices have departed from a past trading range. Our analysis suggests that seemingly excessive (or insufficient) price associations with earnings or other value-relevant statistics can arise as an equilibrium phenomenon even when investors are not cognitively constrained.

Because we consider a setting with rational deviations from a fundamental valuation, our study relates to the literature on rational asset-pricing bubbles (for example, Tirole, 1985). More specifically, in a simple rational pricing bubble, an asset trades above its fundamental value in period t because investors at time t believe the asset will trade above fundamental value in period $t+1$. In equilibrium, the overvaluation increases over time to guarantee a sufficient rate of return on the “overpayment” at any point in time. BPA differs from a simple rational pricing bubble because it pertains to the price response to information about fundamental value as opposed to a predictable deviation from fundamental value.⁴

³ The OLG model originated with Samuelson (1958), which considered a model of production, consumption, saving, and interest rates. The OLG model is very common in the literature on stock markets. For examples, see Banerjee (2011), Spiegel (1998), Tirole (1985), and Watanabe (2008).

⁴ In a subsequent study, Fischer et al. (2014) embed our theory of BPA into a particular rational pricing-bubble framework to explain the observation that equity price multiples are higher for firms that are on meet-or-beat streaks. More specifically, while our study introduces BPA and its implications, Fischer et al. (2014) conjecture that streaks can make a BPA pricing path focal and that the end of a streak is associated with an abrupt reversion to a fundamental pricing path.

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