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## Implications of survival and data trimming for tests of market efficiency<sup>☆</sup>

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### Abstract

Predictability of future returns using ex ante information (e.g., analyst forecasts) violates market efficiency. We show that predictability can be due to non-random data deletion, especially in skewed distributions of long-horizon security returns. Passive deletion arises because some firms do not survive the post-event long horizon. Active deletion arises when extreme observations are truncated by the researcher. Simulations demonstrate that data deletion induces a negative relation between future returns and ex ante information variables. Analysis of actual data suggests a 30–50% bias in the estimated relations. We recommend specific robustness checks when testing return predictability using ex ante information.

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## 1. Introduction

To test market efficiency, prior research estimates cross-sectional regressions of ex post long-horizon stock price performance on ex ante variables (e.g., analysts' forecasts, abnormal accruals).<sup>1</sup> A significant cross-sectional relation implies returns are predictable, i.e., market inefficiency.<sup>2</sup> One scenario that would generate such a significant relation assumes optimistic analysts' forecasts (see Brown et al., 1985; Brown, 1997; Lim, 2001; Abarbanell, 1991; Stickel, 1990)<sup>3</sup> and market's naive reliance on those forecasts in setting prices. Future actual financial performance reveals the optimism, leading to negative forecast errors. This bad "news" lowers prices and generates a negative association between ex post security price performance and ex ante analysts' forecasts or proxies for the predictable biases in these forecasts (e.g., abnormal accruals).

We show that survival and data trimming bias the relation between ex ante information variables and subsequent price performance. Data trimming means either deletion of extreme observations (i.e., data truncation) or winsorization (i.e., setting the values of extreme observations to 1% and 99% percentile values). The bias in the estimated regression relation stems from a combination of (i) the statistical properties of the variables, namely the (right) skewness of long-horizon stock returns,<sup>4</sup> and (ii) research design features that are common and almost inevitable. In particular we discuss data availability (i.e., survival) requirements as well as winsorization or truncation of extreme observations.<sup>5</sup>

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<sup>1</sup>Examples include Teoh et al. (1998a, b), Rajan and Servaes (1997), Dechow et al. (2000), Ali (1996), La Porta (1996), Dechow and Sloan (1997), Frankel and Lee (1998), Lakonishok et al. (1994) and Sloan (1996).

<sup>2</sup>Starting with Fama et al. (1969) and Ball and Brown (1968), a popular test of market efficiency is to simply examine the event-experiencing portfolio's price performance following an event. This genre of tests is typically not subject to the biases we discuss in this study. We focus on problems of inference encountered in *cross-sectional regression tests* of market efficiency that seek to explain the source of market inefficiency (e.g., investors' fixation on analysts' optimistic forecasts). While the post-event-price-performance event studies might not suffer from the biases examined in this study, those studies only provide limited information about the source of market inefficiency. Cross-sectional regression tests' motivation is to explain the source of market inefficiency and thus enhance the reader's confidence in the inference of inefficiency. These issues are discussed in detail below.

<sup>3</sup>Recent research indicates that analyst optimism is due largely to skewness in earnings data (see Gu and Wu, 2003, Abarbanell and Lehavy, 2003; Cohen and Lys, 2003). Also, in recent years evidence of analyst optimism is considerably muted (Brown, 1997). Other results suggest analysts' apparent optimism or pessimism is related to macro-economic conditions and that it is concentrated among economically less important small market-capitalization stocks (Lim, 2001). Overall, the evidence is consistent with (i) skewed forecast errors creating the appearance of analyst optimism, and/or (ii) analysts learning about their optimistic bias, and/or (iii) analyst optimism being a period-specific phenomenon.

<sup>4</sup>See Abarbanell and Lehavy (2003) and Cohen and Lys (2003) for recent examples of research examining methodological problems that arise in drawing inferences when dealing with skewed distributions of earnings and analyst forecast error data.

<sup>5</sup>Our work complements previous research that suggests caution in interpreting the evidence of long-horizon price performance for methodological reasons (see, for example, Barber and Lyon, 1997, Brav, 2000, Kothari and Warner, 1997; Fama, 1998) and others who question the economic significance of the evidence (e.g., Brav et al., 1998, Brav and Gompers, 1997; Fama, 1998).

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