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Anomalies, risk adjustment and seasonality: Australian evidence ☆

Angel Zhong, Manapon Limkriangkrai, Philip Gray *

Department of Banking and Finance, Monash University, Australia

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ABSTRACT

On the basis of raw return analysis, economically significant anomalies appear to exist in relation to the size, momentum, book-to-market and profitability of Australian firms. However, characteristic-sorted portfolios are shown to load in very particular ways on multiple risk factors. After adjusting for exposure to risk, convincing evidence only remains for the size premium. An analysis of seasonality shows that, rather than being consistent throughout the year, anomaly returns are concentrated in a handful of months. We provide and test preliminary explanations of the observed seasonality in these well-known anomalies.

1. Introduction

Modern finance theory is built on two fundamental principles. First, the return on an asset should reflect its inherent risk. Specifically, investors in high (low) risk assets expect to be compensated with high (low) returns. While researchers continue to study precisely what constitutes 'risk', all asset pricing models embody this risk–return relationship in one form or another. The second foundation of modern finance theory is the notion that relevant information is rapidly incorporated into asset prices in an unbiased manner. Accordingly, past information cannot be used to predict future returns.

Over time, however, empirical studies have documented findings that are inconsistent with the two fundamental principles, giving rise to so-called 'anomalies'. Arguably, the three premier anomalies are the size premium (Banz, 1981), the book-to-market effect (Rosenberg, Reid, & Lanstein, 1985; Stattman, 1980), and the profitability of momentum trading (Jegadeesh & Titman, 1993). An extensive research effort has explored the statistical and economic significance of these anomalies in many countries. Australia is no exception. Prior work on the size effect spans many decades, while a respectable body of work has developed in recent years in relation to book-to-market (BM) and momentum effects.

On balance, the weight of Australian evidence strongly indicates the existence of a size effect, and to a lesser extent a value premium. Conclusions on momentum profitability seemingly hinge on which subset of the population of stocks is considered and how individual stocks are weighted into portfolios. Nonetheless, caution is necessary before drawing broad brush conclusions from this body of work. Since any empirical study requires numerous methodological choices, it is inevitable that prior findings reflect a wide variety of differing methodologies. Similarly, the extant literature comprises studies based on samples that differ notably in both the time period that they span and the cross-section of stocks included. Naturally, differences across studies with respect to both chosen methodology and sample availability are relevant when attempting to draw overall conclusions from the extant anomaly literature.

The manner in which returns are adjusted for risk is also acutely relevant to the Australian anomalies literature. Most studies focus on raw returns to portfolios sorted on the characteristic of interest (size, BM, momentum, etc.), with risk adjustment being somewhat piecemeal.[1] Historically, researchers' endeavours to estimate risk-adjusted returns

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* Corresponding author.
E-mail address: Philip.Gray@monash.edu (P. Gray).

[1] Section 2 presents a review of the Australian anomalies literature which documents the extent to which studies rely on raw and/or risk-adjusted returns in drawing their conclusions.

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for Australian equities have been impeded by the unavailability of the risk factors necessary to implement contemporary asset pricing models like the Fama and French (1993) three-factor model (hereafter FF3f model). A handful of early studies use the single-factor CAPM to adjust for market risk. Only recently have empirical studies begun utilising multifactor models. While asset pricing factors are still not freely available (as is the case in the US), improvements in databases now allow researchers to construct their own versions of the requisite factor mimicking portfolios.

The current study makes several contributions to the Australian anomalies and asset pricing literature. As a starting point, we re-examine the evidence in raw returns relating to the size, BM and momentum effects. For each anomaly, we use consistent methodological choices and study a common time horizon, thereby enhancing comparability of their relative importance. One methodological choice of particular interest is to estimate monthly returns to characteristic-sorted portfolios that capture genuine wealth effects to a buy-and-hold investor. Liu and Strong (2008) note that many empirical studies use a simple averaging approach to estimate portfolio returns that implies the monthly rebalancing of stocks to initial weights. In addition to being practically infeasible (or at least prohibitively expensive), this approach is inconsistent with the buy-and-hold investment strategy intended in many studies. Importantly, Liu and Strong demonstrate that the averaging approach induces a bias into estimated returns that, in some cases, leads to incorrect inferences about the existence of anomalies. This further motivates our re-examination of the Australian evidence on size, BM and momentum effects in stock returns using the approach advocated by Liu and Strong.

A second and important contribution is to consider the existence of each anomaly after adjusting for risk factors. Anomalous returns can only be identified in conjunction with an asset pricing model. Since much of the prior Australian literature has been restricted to analysis of raw returns, it is possible that apparent anomalies in raw returns simply reflect risk differentials. By documenting both raw and risk-adjusted returns to characteristic-sorted portfolios, this paper considers the existence of Australian anomalies in a new light. In order to make the risk adjustments, it is necessary to construct the risk factors. While our approach follows the spirit of Fama–French–Carhart, we highlight features of the Australian equity market that justify several modifications to the approach used in the US. In fact, we argue that strict adherence to the Fama–French–Carhart approach to forming the benchmark portfolios would have undesirable consequences in the Australian market.

In addition to re-examining the size, BM and momentum anomalies, our third contribution is to study a relatively new effect that has received little previous attention in Australia. Novy-Marx (2013) suggests that a firm's BM ratio and its gross-profit-to-assets ratio capture different dimensions of value. Irrespective of whether one buys a value (i.e., high BM) stock or a highly profitable stock, productive capacity is being purchased cheaply. Accordingly, both are expected to generate higher average returns. Novy-Marx (2013) shows that, while highly profitable firms are extremely dissimilar to value firms with respect to their BM and market cap, they generate "value-like" excess returns. As part of our analysis of anomalies, therefore, we also test for a positive relationship between future stock returns and profitability. As noted shortly in the literature review, prior Australian work in this area is very much in its infancy, hence the current paper makes a timely contribution.

The fourth contribution of this paper is to explicitly examine the interaction of seasonality with the aforementioned anomalies. The usual approach to studying an anomaly is to examine average returns to characteristic-sorted portfolios, where the averaging is across all calendar months. Naturally, this approach cannot detect a relationship between a characteristic and returns that concentrates in a particular month. Accordingly, we investigate the possible interaction of seasonality with the various anomalies by documenting returns (both raw and risk adjusted) by calendar month. This paper then provides tests of the apparent seasonal patterns in the major anomalies and considers potential explanations.

The main findings can be summarised as follows. Using an analysis of raw returns to characteristic-sorted portfolios, there is evidence of economically and statistically significant effects relating to size, BM, momentum and profitability. To a large extent, these findings are consistent with prior Australian work. However, we proceed to show that key portfolios load significantly on multiple risk factors, highlighting the importance of studying anomalies in terms of risk-adjusted returns. After adjusting for risk using the Fama–French–Carhart four-factor model, the support for anomalies is less convincing. Spread returns to size and profitability-based portfolios remain significant. However, the ability to enter the requisite short positions in highly-unprofitable stocks casts further doubt over the importance of the profitability effect.

The study of seasonalities in anomalies reveals several interesting stylised facts. The profitability of the size effect is far from consistent throughout the year. Following a 'reverse' size premium in June, July has significant small-firm effect. This reversal around the financial year end is consistent with the tax-loss selling hypothesis. However, size premiums in other months are less-easily explained. The value premium appears to concentrate in the first-half of the financial year. Alpha seeking portfolio rebalancing towards higher risk value stocks at the beginning of each year is consistent with this seasonality. The profitability of momentum trading concentrates in quarter-ending months. Average returns to momentum trading are nearly three times higher in quarter-ending months compared to non-quarter-ending months, which may suggest window-dressing by institutional investors.

The remainder of the paper is structured as follows. Section 2 presents a brief review of prior Australian research relating to the four anomalies that are the focus of this study, with particular attention paid to the reliance on raw and/or risk-adjusted returns and the extent that seasonality is considered. Section 3 describes the data used in the study, the procedures for forming characteristic-sorted portfolios, and the empirical methodology. The main results are presented in Section 4, while Section 5 concludes the paper.

2. Prior research

A number of studies have documented a size effect in Australian equity returns. On average, returns to small-cap stocks far exceed returns to large-cap stocks. Over the period 1958–1981, Brown, Keim, Kleidon, and Marsh (1983) report average monthly returns to decile portfolios of the smallest and largest stocks of 6.75% and 1.02% respectively. Beedles, Dodd, and Officer (1988) also document a size effect across 1974–1984. Both Brown et al. (1983) and Beedles et al. (1988) show that the size effect is robust to risk adjustment via the single-factor CAPM. Gaunt, Gray, and McIvor (2000) examine the effect of share price on the size anomaly and seasonality in Australia over the period 1973–1997. In addition to documenting independent size and price effects on stock returns, they report that a negative relationship between size and returns exists in all calendar months (with the exception of December).

Durand, Juricev, and Smith (2007) provide further evidence of the small-firm effect over the period 1990–2001. Utilising a variety of portfolio construction approaches, the small-stock portfolio consistently generates significantly higher returns than the big-stock portfolio. Similarly, over the period 1992–2005, Gharghori, Lee, and Veeraraghavan (2009) document a negative relationship between firm size and both raw returns and FF3f alphas. Most recently, Gray (2014) documents a size premium in raw returns of 4% per month spanning four decades (1974–2010). However, of relevance to the current paper, he demonstrates that the magnitude of the size premium is materially overstated when portfolio stocks are assumed to be rebalanced monthly (as opposed to genuine buy-and-hold investments).