Migration and its contribution to the size and value premiums: Australian evidence

Philip Gharghori, Yusuf Hamzah and Madhu Veeraraghavan*

Department of Accounting and Finance, Monash University, Clayton, Victoria 3800, Australia

Corresponding Author
Professor Madhu Veeraraghavan
Department of Accounting and Finance
Monash University
Victoria 3800 Australia
Tel: 61 3 9905 2432
Fax: 61 3 9905 5475
Email: Madhu.Veeraraghavan@buseco.monash.edu.au

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Abstract

This paper investigates how different types of migration contribute to the size and value premiums for Australian equities. We find that: (a) the majority of stocks that stay in the same portfolio during the next period contribute to both the size and value premiums, (b) small-cap neutral and small-cap growth stocks that move to a lower market-to-book type contribute moderately to the size premium, (c) value stocks that move to a higher market-to-book type contribute moderately to the value premium (d) small-cap stocks that grow to be big-cap stocks make minor contributions to the size premium and (e) value stocks that change size classification, make minor contributions to the value premium. Overall, small-cap value stocks that stay in the same group account for large portions of both the size and value premiums.

JEL classification: G10; G11; G12

Keywords: Migration; Size premium; Value premium; Fama-French model

1. Introduction

It is well documented that firm size and the ratio of book-to-market equity explain cross-sectional variations in stock returns better than market beta (Banz, 1981; Rosenberg, Reid and Lanstein, 1985; Fama and French, 1992). Fama and French (hereafter referred to as FF) show that the market factor and factors related to firm size and book-to-market together provide a simple and powerful explanation of equity returns (FF, 1993). Despite the empirical success of the FF (1993) model, many researchers argue that the model lacks theoretical appeal. For example, Lo and MacKinlay (1990) and Berk (2000) suggest that the success of the FF model comes from identifying variables that have good within-sample fit (that is, data-snooping bias). Other researchers (Black, 1993; MacKinlay, 1995; Kothari, Shanken and Sloan, 1995; Breen and Korajczyk, 1995) argue that the model is riddled with flaws such as data mining, the unwarranted rejection of the CAPM on an ex post basis, survivorship bias and sample selection bias. Lakonishok, Shleifer and Vishny (1994), Daniel and Titman (1997) and Barberis and Thaler (2003) develop theories and models that support behavioural interpretations for the size and value premiums, hence questioning FF's risk-based proposition.

In a recent paper, FF (2007b) find that the higher average returns of value stocks are associated with the convergence of the stocks' price-to-book ratios. The price-to-book ratios of value stocks tend to increase one year after portfolio formation, whereas the opposite holds for growth stocks. This suggests that the migration of stocks across portfolio groups could provide insights into how the size and value premiums arise.

In their analysis of stock migration in the US, FF (2007a) document that the size premium is primarily due to positive returns of small-cap stocks that grow enough to be reclassified as big-cap from one year to the next. They also report that the value premium is due to three factors: (1) the improvement in type[1] of value stocks, irrespective of size, (2) the

[1] Improvement in type refers to the movement of a stock from value towards growth. Conversely, deterioration in type refers to migration from growth towards value.

deterioration in type of growth stocks, with small-cap stocks contributing more than big-cap stocks and (3) for stocks that remain in the same portfolio, the higher returns of value stocks over growth stocks, irrespective of size.

The central objective of this paper is to provide an out-of-sample check on the migration analysis of FF (2007a). To understand the central contribution of this study, let us first briefly examine the evidence on the size and value effects in Australia. Similar to the US findings, early studies document a size effect in Australia (Brown, Kleidon and Marsh, 1983; Beedles, Dodd and Officer, 1988; Anderson, Lynch and Mathiou, 1990; and Gaunt, Gray and McIvor, 2000). In contrast, early research on the value effect is more limited due to the difficulty in obtaining accounting data that are linked to stock returns for listed Australian companies. For example, with a restricted dataset, Anderson, Lynch and Mathiou (1990) show that there is a weak book-to-market effect in Australia.

More recent evidence shows that there are strong size and value effects in the Australian market (Halliwell, Heaney and Sawicki, 1999; Gaunt, 2004; Chan and Faff, 2005; Gharghori, Chan and Faff, 2006 and 2007; and Kassimatis, 2008). As an example, Gharghori, Chan and Faff (2007) report a monthly SMB premium of 1.43% and a monthly HML premium of 0.87%. Furthermore, Durand, Juricev and Smith (2007) confirm the existence of a strong size premium in Australia. In sum, the evidence indicates the existence of strong size and value effects in Australia. In addition, the magnitudes of the premiums are much larger than those observed in the US. As such, this makes Australia an ideal setting to assess the out-of-sample validity of the migration analysis of FF (2007a).

Although the size and value premiums are considerable in Australia, the performance of the FF model in explaining cross-sectional variation in equity returns is poor (Halliwell et al., 1999; Faff, 2001 and 2004; Durack, Durand and Maller, 2004; Gaunt, 2004; Chan and Faff, 2005; Durand, Limkriangkrai and Smith, 2006; Gharghori, Chan and Faff, 2007; Gharghori, Lee and Veeraraghavan, 2007; Kassimatis, 2008; and Limkriangkrai, Durand and Watson, 2008). For example, Gharghori, Chan and Faff (2007) report adjusted R-squares of

around 60% in Australia as compared to FF (1993) who report R-squares of about 80-90% in the US. This provides further impetus to undertake a migration analysis in Australia as examining the nature of the size and value premiums may lead to a greater understanding on why the FF model does not perform well in Australia.

Additionally, we innovate by examining whether momentum[2] (Jegadeesh and Titman, 1993) in the context of stock migration is associated with the size and value premiums. Most studies that have examined stock momentum in Australia, such as Liew and Vassalou (2000), Gaunt and Gray (2003), Hurn and Pavlov (2003), Demir, Muthuswamy and Walter (2004), and Gharghori, Lee and Veeraraghavan (2007) support the existence of the momentum effect in Australia. In addition, Gharghori, Lee and Veeraraghavan (2007) find that the FF model fails to explain the momentum anomaly, similar to FF (1996) in the US. To a large degree, this motivates our analysis of whether the migrations of stocks are associated with the stocks' past performance. Specifically, we form migration portfolios using stocks' past returns (6- and 12-month) and examine whether momentum is associated with migrations of stocks that contribute to the size and value premiums in Australia.

A further reason why we study the Australian market is because it differs significantly from that of the US. With 1,974 stocks listed and a market capitalisation of AUD 1,597 billion,[3] the Australian Securities Exchange (ASX) is considerably smaller than the US equity market. The NYSE alone has about 2,764 stocks, with a market capitalisation of about USD 25,000 billion[4] – and this does not include the country's two other major exchanges, NASDAQ and Amex. In addition, the types of firms that comprise the two countries' markets differ. Small firms dominate the Australian market; the 10 largest firms account for about 40%

[2] Momentum is a short-horizon phenomenon whereby past winner stocks continue to perform well and past loser stocks continue to do relatively worse.

[3] Information as of August 2007, obtained from ASX website.

[4] Information as of December 2006, obtained from the NYSE website.

of the market capitalisation of the ASX200.[5] By contrast, the largest 10 firms of the NYSE account for about 13% of that exchange's capitalisation.[6] Further, about two-thirds of the ASX200's market capitalisation is concentrated in financials and materials companies.[7]

Our findings show that the size premium has three main sources: (1) it is primarily driven by small-cap value stocks that remain in the same portfolio and have higher annual returns than big-cap value stocks; (2) it is moderately driven by a large proportion of small-cap neutral and small-cap growth stocks that deteriorate in type and have higher annual returns relative to their big-cap stocks counterparts; and (3) small-cap neutral stocks that stay in the same portfolio, small-cap value stocks that deteriorate in type, and small-cap value and small-cap neutral stocks that grow to become big-cap all make small contributions to the size premium.

We report three main sources of the value premium: (1) it is primarily driven by small-cap value stocks that stay in the same portfolio and have higher annual returns than small-cap growth stocks; (2) it is moderately driven by a large proportion of value stocks (both big- and small-cap) that improve in type and have higher annual returns than growth stocks; and (3) big-cap value stocks that stay in the same portfolio, small-cap value stocks that grow to become big-cap and big-cap value stocks that shrink to become small-cap all make small contributions to the value premium.

We find that momentum is associated with the component of the value premium (for both big- and small-cap) that is driven by stocks that improve in type. We also find that momentum is associated with the component of the size premium that is driven by small-cap stocks that grow to big-cap in the next period. The rest of the paper is organised as follows.

[5] Information obtained from the S&P/ASX200 Index Quarterly Review Q2 2007, from the ASX website. The ASX200 is a value-weighted stock market index of the 200 largest companies listed on the Australian Securities Exchange.

[6] Information as of August 2007, obtained from the NYSE Composite brochure, from the NYSE website.

[7] Information obtained from the S&P/ASX200 Index Quarterly Review Q2 2007, from the ASX website.

Section 2 presents the research questions and discusses the data and methodology. Section 3 reports the empirical findings and Section 4 concludes.

2. Research questions, data and methodology

2.1 Research questions

This study investigates the relationship between stock migration and the size and value premiums. We also investigate the role of momentum in contributing to these premiums. Specifically, we investigate the following questions:

1) Do stocks that stay in the same size/market-to-book (size-M/B) portfolio contribute to the value premium?
2) Do stocks that improve in type within a size classification contribute to the value premium?
3) Do stocks that deteriorate in type within a size classification contribute to the value premium?
4) Do stocks that change (or stay in a) M/B type contribute to the size premium?
5) Do stocks that change size, either from small- to big-cap or from big- to small-cap, contribute to the size premium?
6) Is momentum associated with the migrations of stocks that contribute to the size and value premiums?

2.2 Data

The test period for the migration analysis is 1991 to 2006. As we require 12 months of prior share price data to construct past returns and 12 months of prior accounting data to construct the FF portfolios, the dataset spans 1990 to 2006. We obtain returns data from the Centre for Research in Finance (CRIF) database. We obtain the accounting data from Aspect Huntley. We define book equity as net tangible assets, which is total shareholder's equity minus total intangibles (including R&D expenditure). A stock must meet three

conditions for it to be included in our sample. First, it must trade in the month of portfolio formation in December of year t-1. Second, to ensure the accuracy of the accounting data, it must satisfy a simple accounting identity.[8] Third, following FF (1993), it must not have negative or missing book equity in December of year t-1.

2.3 Portfolio construction

Firms are sorted based on market capitalisation into two size groups (Small-Cap and Big-Cap)[9] and three M/B groups (Value, Neutral and Growth) apportioned 30-40-30, respectively.[10] Following, Gharghori, Chan and Faff (2007), we use market capitalisation in December of year t-1 to form size groups and use market capitalisation in December of year t-1 and book equity in the fiscal period t-1 to form M/B groups. Six size-M/B portfolios are formed based on the intersection of the two size groups and three M/B groups: Small-Cap Value (SV), Small-Cap Neutral (SN), Small-Cap Growth (SG), Big-Cap Value (BV), Big-Cap Neutral (BN) and Big-Cap Growth (BG). Firms are ranked in December of year t-1 and are placed into one of these six portfolios from January to December of year t.[11]

The size-M/B portfolios are rebalanced annually. The annual return of a size-M/B portfolio is the sum of its 12 monthly returns in period t. The monthly return is the value weight of continuously compounded monthly returns of stocks allocated to the size-M/B portfolio in December t-1. SMB is the average of the difference between the returns of the three small-size portfolios and the returns of the three big-size portfolios (SV - BV, SN - BN, SG - BG). HML is the average of the difference between the returns of low M/B portfolios and

[8] Total Assets – Total Liabilities – Total Equities = Zero.

[9] Small-cap firms are those that have December market capitalisations below the ASX median and big-cap firms are those that have December market capitalisations above the ASX median.

[10] After calculating firms' market-to-book ratios (M/B), firms are divided into groups as follows: value (V, bottom 30%), neutral (N, middle 40%) and growth (G, top 30%).

[11] As most firms in Australia have a June financial year-end, firms are ranked in December so that there is a six-month lag between their book values and market values.

the returns of high M/B portfolios[12] for both small (SV - SG) and big size classifications (BV - BG).

2.4 Migration portfolios

As stock classification is done annually, stocks can either remain or move from the original size-M/B portfolios in December t-1 to the new re-classified portfolio group(s) in December t. In general, there are two types of migration: migration within the six size-M/B groups and migration out of the six size-M/B groups into the following four groups:

- "Bad Delists" – stocks that disappear during period t for substandard reasons (for example, bankruptcies or not meeting listing requirements),
- "Good Delists"[13] – stocks that disappear for operational reasons, such as merger or acquisition,
- "Neg" – stocks with negative book equity in period t and
- "NA" – stocks with missing book equity in period t.

Accordingly, stocks in each of the six size-M/B portfolios in December t-1 have 10 possible destination groups to move to in December t. A group of stocks that has moved to one of the destination groups is called a migration portfolio. Each of the six size-M/B portfolios has 10 migration portfolios. In total, there are 60 migration portfolios.

Our aim is to analyse how migration contributes to annual size and value premiums. The average annual size and value premiums can be traced directly to the average annual returns of the six size-M/B portfolios. Breaking down further, the average contribution of the

[12] Prior FF studies use book-to-market, hence HML is associated with the returns of high book-to-market portfolios minus the returns of low book-to-market portfolios. Consistent with FF (2007a), we use the market-to-book ratio.

[13] Based on CRIF delisting codes, stocks coded as M (merged with another firm) or A (acquired by another firm), are deemed "Good Delists." For all other delisting codes, stocks are deemed "Bad Delists." Stocks with multiple delisting codes that include M or A as well as other delisting codes are deemed "Good Delists."

10 migration portfolios influences each of the average annual returns of the size-M/B portfolios.

The annual return of a migration portfolio is the sum of the portfolio's 12 monthly returns in period t, where the monthly return is the value weight of continuously compounded monthly returns of individual stocks allocated to the portfolio in December t-1. The value-weight portion of a migration portfolio is the market capitalisation portion of all stocks in the portfolio that has moved to the specific destination group in December t, relative to the total market capitalisation of the size-M/B portfolio in December t-1.

The annual contribution to the size-M/B portfolio is the annual return multiplied by the annual value weight (by market capitalisation) portion of the migration portfolio. We take a time-series average of the outcomes (annual returns, portions and contributions associated with the migration portfolios) over the period 1991 to 2006. The average (annual) contributions associated with the migration portfolios contribute to the average annual returns of the six size-M/B portfolios, and thus to the size and value premiums.

2.5 Summarised migration portfolios

We follow FF (2007a) in grouping the 60 migration portfolios into 24 summarised migration portfolios. To achieve this, we split each size-M/B portfolio into four broad movement categories:

- The "Same" category combines stocks that stay in the same size-M/B portfolios and stocks that move to the outside group "NA" from December t-1 to December t. This merges 12 original migration portfolios into six summarised migration portfolios.[14]

[14] For example, the summarised portfolio for "Same" consists of stocks that migrated from the SV portfolio in December t-1 to the SV portfolio in December t and those that migrated from the SV portfolio in December t-1 to the NA group in December t.

- The “Plus” category combines stocks that improve in type and stocks that move to the outside group “Good Delist” from December t-1 to December t. This merges 12 original migration portfolios into six summarised migration portfolios.
- The “Minus” category combines stocks that deteriorate in type and stocks that move to the outside groups “Bad Delist” and “Neg” from December of t-1 to December t. This merges 18 original migration portfolios into six summarised migration portfolios.
- The “dSize” category combines movements that change size classification from December t-1 to December t. For small-cap stocks, “dSize” combines migration from small- to big-cap; for big-cap stocks, it combines migration from big- to small-cap. This merges 18 original migration portfolios into six summarised migration portfolios.

Subsequently, we analyse the average (annual) contributions to the size-M/B portfolios due to the summarised migration portfolios. Contributions derived from migration of stocks with a different size characteristic are contributions to the size premium. Contributions derived from migration of stocks with a different M/B characteristic are contributions to the value premium.

2.6 Momentum

Instead of calculating the annual return of the portfolios in year t, we re-do the analysis using past 6 and 12 month stock returns. These past returns are calculated by summing the value weight of stocks’ returns for the 6 months and 12 months, respectively, prior to portfolio formation in December t-1. We follow FF (1996) in excluding the latest one-month return prior to portfolio formation. Here, we study whether momentum is associated with migration that contributes to the size and value premiums.

3. Empirical findings

3.1 Size and value premiums

Table 1 reports descriptive statistics for the six size-M/B portfolios' monthly returns, SMB and HML. The time-series averages of the size-M/B portfolios' monthly returns are higher for the small-size portfolios (SV 2.89%, SN 2.56% and SG 2%) than for the big-size portfolios (BV 1.6%, BN 1.44% and BG 0.83%), and are higher for value portfolios (SV and BV) than for growth (SG and BG). Not surprisingly, both of the average monthly SMB (1.19%) and HML (0.83%) premiums are positive and statistically significant for the period 1991-2006. These results are consistent with Gharghori, Chan and Faff's (2007).

[Insert Table 1]

3.2 Migration portfolios

In Table 2, Panel A displays the time-series average of the value weight portions of the migration portfolios, and Panel B displays the equal-weight portions of the migration portfolios. Panel A shows that stocks allocated to the initial six size-M/B portfolios in December of year t-1 are most likely to stay in the same portfolio when the six size-M/B portfolios are reformed in December of year t. In particular, small-cap value stocks, big-cap neutral stocks and big-cap growth stocks tend to have high one-year persistence rates. For example, based on market capitalisation, 63.80% of the stocks that are in the SV portfolio in December of year t-1 are allocated again to this portfolio in December of t. The one-year persistence rate is even higher for the two big-cap stock portfolios, 76.81% (BN) and 72.43% (BG), respectively. The one-year persistence rates for SN, SG and BV are 46.96%, 41.83% and 55.02%, respectively.

[Insert Table 2]

The second largest value-weight portions of the migration portfolios (for each of the six size-M/B portfolios) are also confined within the same size classification. Excluding stocks that stay in the same portfolio in the next rebalancing period, there seems to be a type-

divergence movement associated with the size classification. Small-cap neutral and small-cap growth stocks gravitate toward deterioration in type (20.21% of the aggregate market capitalisation in SN move to SV, and 30.05% of SG move to SN), whereas big-cap value and big-cap neutral stocks gravitate toward improvement in type (40.51% of BV move to BN, and 15.11% of BN move to BG).

Excluding stocks that stay in the same portfolios, we also find a type-convergence movement for the two outmost portfolios (SV and BG). Since small-cap value stocks cannot further deteriorate in type, stocks tend to improve in type (18.15% of SV move to SN). By contrast, because big-cap growth stocks cannot improve further in type, these stocks tend to deteriorate in type (24.69%).

For stocks that change size, we again observe type-divergence movement. Stocks that migrate from small- to big-cap tend to improve in type and, if they cannot improve any further, stay in the same type classification. For example, 7.12% of stocks move from SV to BN and 10% of stocks move from SN to BG. Small-cap growth stocks cannot improve beyond the growth type classification; accordingly, when they change size, 13.6% of stocks move from SG to BG.

By contrast, stocks that migrate from big- to small-cap tend to deteriorate in type, and if they cannot deteriorate any further, they stay in the same type classification. Only 0.17% of stocks move from BG to SN, and 0.16% of stocks move from BN to SV. Big-cap value stocks cannot deteriorate beyond the value type classification; accordingly, when they change size, 1.89% of stocks move from BV to SV. Finally, the type divergence of migrating stocks that change size from big- to small-cap is smaller than the type divergence of migration from small- to big-cap.

Using value weighting to reflect the proportions of the migration portfolios provides a better indicator, as it accounts for stock size. For example, Panel B shows that there are more stocks that migrate from big- to small-cap than from small- to big-cap. This is opposite to what we observe when we use value weighting in Panel A. Small-cap stocks rarely

become big-cap stocks in one year. When they do, however, small-cap stocks tend to account for a sizeable portion of the small-cap stock portfolio's market capitalisation. On the other hand, although a large portion of stocks change from big- to small-cap, they account for only a trivial portion of the big-cap stock portfolio's market capitalisation.

In both panels, few stocks move to the delisted categories when portfolios are rebalanced in the next period. Only a small portion of growth stocks become delisted (SG with 0.01% as bad delists, BG with 0.05% for both good and bad delists). We believe this result is due to our filtering criterion whereby stocks must trade in December of t-1.[15] The issue arises because many stocks that delist in the next period stop trading long before the next rebalancing period,[16] that is, prior to December of year t. If stocks stop trading one year before (that is, in December of year t-1), our filtering criterion excludes them from our sample in December of year t. Hence, employing this filter increases the robustness of our findings by accounting for thin trading; in doing so, however, we might have understated the migration of stocks to the delisted categories (good or bad).

Book equity is more likely to be negative for growth stocks[17] than for neutral or value stocks. This disparity is largest when comparing small-cap stocks. Table 2, Panel A, shows that on average, 1.63% (2.08%) of small-cap value (small-cap neutral) stocks (by market capitalisation) migrate to the negative book equity category. By comparison, 7.1% of small-cap growth stocks (by market capitalisation) move to negative book equity.

A possible explanation is that growth firms tend to pursue more aggressive business strategies and carry greater proportional amounts of debt (that is, financial leverage). As a result, they are more likely to have negative book equity in the next rebalancing period. This is especially common for small-cap growth firms. These firms are most likely to be start-up firms that require more financial leverage for business expansion. This could explain why

[15] The thin trading filter is necessary as a large number of small firms in the Australian market are thinly traded.

[16] In most cases, the stocks stop trading due to a trading suspension.

[17] FF (2007a) also observe this finding and suggest that firms in the growth portfolios are distressed.

growth stocks, especially small-cap growth stocks, tend to move to the negative book equity group in the next rebalancing period. Movement to the missing book equity group is more common for small-cap stocks and value stocks, both big- and small-cap.

Table 3 reports the average annual returns associated with the 60 migration portfolios. We form annual returns for the migration portfolios by summing the 12 monthly returns of the migration portfolios in period t. For example, small-cap value stocks in December t-1 that stay in the same group in December t account for 37.45% of the average migration portfolio's annual return. We observe that migration portfolios that account for large portions of market capitalisation (from Table 2) do not always have high average annual returns. This is because to examine the annual contribution of the stock migrations to the size-M/B portfolio, we need to account both for a migration portfolio's annual value weight (by market capitalisation) proportion and its annual return.

[Insert Table 3]

3.3 Summarised migration portfolios: annual portfolio returns

First, we examine the average annual (value weight) proportions and the average annual returns of the summarised migration portfolios. We then analyse these portfolios' average contributions to the average annual returns of the size-M/B portfolios. Finally, we derive their contributions to the average annual size and value premiums.

3.3.1 "Same" group

We find that, like the migration portfolios, stocks tend to have a high one-year persistence rate when using the summarised migration portfolios. Table 4, Panel A, shows that the value-weight portions of stocks that stay in the "Same" group are 64.23% for SV (SN 47.07%, SG 42.14%, BV 56.49%, BN 76.81% and BG 72.43%). Stocks that stay in the "Same" group also tend to have high average annual portfolio returns. Small-cap stocks (SV 37.17%, SN 30.66% and SG 14.29%) tend to generate higher returns than big-cap stocks (BV 16.72%,

BN 16.44% and BG 10.53%) and value stocks (SV and BV) tend to generate higher returns than growth stocks (SG and BG). Our preliminary results regarding the migration of stocks to the “Same” group suggest that there are strong size and value premiums.

[Insert Table 4]

Not surprisingly, Panel A shows that stock migration to the “Same” group translates to high average contributions to the average annual returns of the size-M/B portfolios (SV 25.12%, SN 14.85%, SG 7.64%, BV 9.78%, BN 12.94% and BG 8.29%). In particular, this type of stock migration contributes more to small-cap value (and neutral) stocks than to big-cap value (or neutral) stocks. The difference between the average contributions of small-cap value (or neutral) stocks and big-cap value (or neutral) stocks creates a positive contribution to the average annual size premium. Panel B shows that the difference between SV and BV stocks contributes 15.34%, whereas the difference between SN and BN stocks contributes only 1.9% to the average annual size premium. By contrast, the difference between SG and BG stocks contributes -0.65% to the average annual size premium.

Panel A also shows that value stocks that stay in the “Same” group make higher average contributions (SV 25.12% and BV 9.78%) to the average annual returns of the size-M/B portfolios than growth stocks (SG 7.64% and BG 8.29%). The differences in the average contributions of value and growth stocks cause a positive contribution to the average annual value premium. Panel B shows that the difference between SV and SG stocks contributes 17.48%, and the difference between BV and BG stocks contributes 1.49% to the average annual value premium. Overall, stocks that stay in the “Same” group (excluding SG) in the next rebalancing period contribute positively to both the average annual size premium and value premium. The high, positive contribution of small-cap value stocks generates much of the premiums.

3.3.2 Segregation of the "minus" and "plus" groups

We find a type divergence movement associated with size classification similar to the results found with migration portfolios, which exclude stocks that stay in the "Same" group (see Section 3.2). Table 4, Panel A, displays the results. Large portions (value weight) of small-cap neutral stocks (22.30%) and small-cap growth stocks (42.41%) tend to deteriorate in type in the next rebalancing period. By contrast, large portions (value weight) of big-cap value stocks (40.94%) and big-cap neutral stocks (15.11%) tend to improve in type.

There is also a type convergence movement for the two outmost portfolios (small-cap value and big-cap growth). A large portion (value weight) of small-cap value stocks (21.15%) improve in type, whereas big-cap growth stocks tend to deteriorate in type (27.21%). To take into account the joint effect of both type divergence and convergence movements on average annual returns, we perform the analysis on the "Minus" and "Plus" groups separately.

3.3.2.1 "Minus" group analysis

By design, value stocks are at the bottom of the type classification. Consequently, migration of stocks that move to the "Minus" group in the next rebalancing period are more common among neutral and growth stocks (SN 22.30%, SG 42.41%, BN 7.84% and BG 27.21%) than among value stocks (SV 1.63% and BV 0.47%). Table 4, Panel A, displays these results. It also shows that stocks that move to the "Minus" group have a more dispersed distribution of average annual portfolio returns (ranging from -0.12% to 32.91%) than stocks that move to the "Same" group (10.53% to 37.17%). In addition, small-cap stocks (SV 24.30%, SN 32.91% and SG 23.64%) tend to have higher average annual returns than big-cap stocks (BV -0.12%, BN 17.09% and BG 8.56%).

A higher proportion of small-cap stocks deteriorate in type than big-cap stocks. Small-cap stocks that deteriorate in type are nonetheless rewarded with high average annual returns. As for the impact of stock type, we could not identify a common relationship between

value and growth stocks that holds across size stratifications. Small-cap value stocks and small-cap growth stocks have similar average annual portfolio returns (SV 24.30% vs. SG 23.64%), whereas big-cap value stocks tend to have a lower average annual portfolio return than big-cap growth stocks (BV -0.12% vs. BG 8.56%). Hence, our preliminary results indicate that both the proportions of the summarised stock migration and the stocks' returns influence the contributions by stocks that migrate to the "Minus" group.

Table 4, Panel A, shows that small-cap stocks that migrate to the "Minus" group on average contribute more to the average annual returns than big-cap stocks (SV 0.38%, SN 6.85%, SG 9.74%, BV 0.05%, BN 1.06% and BG 2.2%). The difference between the average contributions of small-cap stocks and big-cap stocks creates a positive contribution to the average annual size premium. As Panel B shows, the difference between SV and BV stocks is 0.33%, between SN and BN stocks is 5.79%, and between SG and BG stocks is 7.54%.

Panel A also shows that value stocks (SV 0.38% and BV 0.05%) that migrate to the "Minus" group on average contribute less to the average annual returns than growth stocks (SG 9.74% vs. BG 2.2%). The difference in the average contributions of value and growth stocks creates a negative contribution to the average annual value premium. As Panel B shows, the difference between SV and SG stocks is -9.36% and the difference between BV and BG is -2.15%.

In summary, the migration of stocks to the "Minus" group in the next rebalancing period contributes positively to the average annual size premium and negatively to the average annual value premium. The high, positive contributions of small-cap neutral and small-cap growth stocks drive the size premium.

3.3.2.2 "Plus" group analysis

Growth stocks are in the top type classification. Accordingly, the migration of stocks to the "Plus" group in the next rebalancing period is more common among value and neutral stocks

(SV 21.15%, SN 12.25%, BV 40.94% and BN 15.11%) than among growth stocks (SG 0% and BG 0.05%). Table 4, Panel A, shows these results.

We find that, similar to stocks that move to the “Minus” group (see Section 3.3.2.1), stocks that move to the “Plus” group seem to have a more dispersed return distribution (ranging from 0% to 25.34%) than stocks that move to the “Same” group. Table 4, Panel A, shows these results.

We could not identify a common relationship to size that holds for all small- and big-cap stocks. Small-cap value stocks tend to have a higher average annual portfolio return (SV 25.34%) than big-cap stocks (BV 22.74%). On the other hand, small-cap neutral and small-cap growth stocks have lower portfolio returns (SN 12.65% and SG 0%) than big-cap neutral and big-cap growth stocks (BN 12.83% and BG 0.74%). Regarding type, value stocks (SV and BV) tend to have higher portfolio returns than growth stocks (SG and BG).

As Panel A shows, small-cap stocks that migrate to the “Plus” group make a lower average contribution to average annual returns than big-cap stocks (SV 4.19%, SN 2.3%, SG 0%, BV 9%, BN 3.09% and BG 0.01%). The difference between the average contributions of small- and big-cap stocks creates a negative contribution to the average annual size premium. Table 4, Panel B, shows that the difference between SV and BV stocks is -4.80%, SN and BN stocks is -0.79%, and SG and BG is -0.01%.

In addition, Panel A shows that value stocks that migrate to the “Plus” group make higher average contributions (SV 4.19% and BV 9%) to the average annual returns than growth stocks (SG 0% and BG 0.01%). The difference in the average contributions by value and growth stocks creates a positive contribution to the average annual value premium. Panel B shows that the difference between SV and SG stocks (BV and BG stocks) contributes 4.19% (8.99%) to the average annual value premium.

In summary, the migration of stocks to the “Plus” group in the next rebalancing period contributes negatively to the average annual size premium and positively to the average

annual value premium. Big-cap value stocks contribute more to the value premium than small-cap value stocks.

3.3.3 "dSize" group analysis

As expected, the migration of stocks that change size groups from small- to big-cap account for a large value-weight portion of small-cap stocks' market capitalisation (SV 12.99%, SN 18.38% and SG 15.45%). Table 4, Panel A, shows these results. On the other hand, the migration of stocks that change size from big- to small-cap account for only a small value-weight portion of big-cap stocks' market capitalisation (BV 2.1%, BN 0.24% and BG 0.31%). Changing from big- to small-cap is rewarded with a larger portfolio return (BV 19.6%, BN 15.62 and BG 19.30%) than changing from small- to big-cap (SV 6.33%, SN 5.51% and SG 1.26%). However, the contributions to the returns of the size-M/B portfolios by stocks with shrinking capitalisations are minimized because they constitute only a small portion of the big-cap portfolios.

Consistent with the definition of SMB, we analyse dSize's contribution to the average annual size premium by assessing whether the contribution comes from small- or big-cap stocks. A positive (negative) contribution from small-cap stocks that change to big-cap creates a positive (negative) contribution to the average annual size premium. Conversely, a positive (negative) contribution from big-cap stocks that change to small-cap leads to a negative (positive) contribution to the average annual size premium.

As Panel C shows, small-cap value (and neutral) stocks that grow to be big-cap in the next rebalancing period contribute to a positive average annual size premium (SV 0.31% and SN 1.23%). Small-cap growth stocks, however, make a minor negative contribution to the average annual size premium (SG -0.08%). Overall, small-cap stocks that grow to be big-cap generate a 1.46%[18] annual size premium. By contrast, stock migration from big- to small-cap

[18] The total 1.46% contribution to the average annual size premium is equal to 0.31% (SV) + 1.23% (SN) – 0.08% (SG).

(BV 0.5%, BN 0.04% and BG 0.02%) contributes negatively to the average annual size premium, reducing the premium by 0.56%.[19]

In addition, value stocks that change size classification (SV to BV, BN or BG (0.31%); or BV to SV, SN or SG (0.5%)) make a higher average contribution than growth stocks that change size classification (SG to BV, BN or BG (-0.08%); or BG to SV, SN or SG (0.02%)). As Panel C shows, the difference between the average contributions of small-cap value and small-cap growth stocks, in which both groups of stocks change size to big, creates a small, positive contribution (0.40%) to the average annual value premium. Likewise, but in the opposite direction, the difference between the average contribution of big-cap value and big-cap growth stocks, in which both group of stocks change size to small, creates a positive contribution (0.49%) to the average annual value premium.

In summary, small-cap stocks that grow to become big-caps in the next rebalancing period make minor contributions to both the average annual size and value premiums. Big-cap stocks that shrink to become small-caps in the next rebalancing period make a minor negative contribution to the size premium and a minor positive contribution to the value premium.

3.3.4 Total size-M/B average annual returns

Small-cap stocks make greater total contributions (SV 30.01%, SN 25.22% and SG 17.30%) to the average annual returns of the size-M/B portfolios than big-cap stocks (BV 19.33%, BN 17.13% and BG 10.51%). The last part of Table 4, Panel A, shows these results. When combined, the average annual size premium is 8.52%.[20] Value stocks (SV and BV) make

[19] The contribution to the size premium is negative because of the definition of SMB. Small-cap stocks that change size to big-cap contribute 1.46%, whereas big-cap stocks that change size to small-cap contribute 0.56%.

[20] 8.52% = [(30.01% – 19.33%) + (25.22% – 17.13%) + (17.3% – 10.51%)] divided by 3.

greater total contributions than growth stocks (SG and BG); the average annual premium for these stock groups is 10.77%.[21]

The annual return premiums derived from migration (Table 4, Panel A) differ slightly from the annual return premiums calculated from the monthly SMB and HML values (Table 1). This is because in calculating the annual contribution of migration, we assign annual value weighting, as opposed to monthly value weighting, to the four summarised migration portfolios ("Same," "Minus," "Plus" and "dSize"). This weighting adjustment alters the annual return premiums. Accordingly, the average annual size and value premiums are different. The annual calculations deliver the same message as the monthly calculations, however, both the size and value premiums on annual returns are positive and substantial.

3.4 Summarised migration portfolios: past returns

3.4.1 "Same" group

Small-cap value stocks that stay in the "Same" group greatly contribute to both the average annual size (15.34%) and value premiums (17.48%). Table 4, Panel B, displays these results. Table 5 shows the average past 6-month (and past 12-month) returns associated with the summarised migration portfolios. If momentum drives migration of the "Same" group stocks, we should observe large average past returns for the small-cap value stocks that migrate to the "Same" group, and small-cap value stocks should have a larger average past return than small-cap neutral or small-cap growth stocks. As Table 5, Panel A, shows, however, the average past 6-month returns of small-cap value stocks that migrate to the "Same" group is small (relative to the magnitude of the size and value premiums due to the migration of SV stocks). Further, they do not have a larger average past 6-month return (1.50%) than small-cap neutral (1.83%) or small-cap growth stocks (2.46%). Similarly, as Panel B shows, the average past 12-month returns (SV 1.83%, SN 1.79% and SG 3.43%) do not provide a convincing case for momentum. We therefore conclude that momentum is not

[21] 10.77% = [(30.01 – 17.3%) + (19.33% – 10.51%)] divided by 2.

associated with the positive size and value premiums from small-cap value stocks migrating to the “Same” group.

[Insert Table 5]

3.4.2 “Minus” group

Small-cap neutral and small-cap growth stocks that migrate to the “Minus” group contribute greatly to the average annual size premium (5.79% and 7.54%, respectively). Table 4, Panel B, displays these results. If momentum drives the “Minus” stock migration, we should observe large average past returns for both small-cap neutral and small-cap growth stocks that migrate to the “Minus” group. However, as Panel A shows, this is not the case. The average past 6-month returns for both SN (0.09%) and SG (0.64%) are small. Further, the past 6-month returns for SN and SG stocks are both lower than for SV stocks (0.94%). This is inconsistent with the momentum proposition because SV stocks contribute only 0.33% to the average annual size premium (see Table 4, Panel B).

Analysis of the past 12-month returns provides conflicting results (see Table 4, Panel B). First, we find weak support for the proposition that momentum might play a role in driving the average annual size premium for small-cap growth stocks. Looking across all stocks that move to the “Minus” group, small-cap growth stocks have a higher average past 12-month return (0.75%). Further, small-cap growth stocks that migrate to the “Minus” group also have a higher average past 12-month return (0.75%) than small-cap value (-0.8%) and small-cap neutral stocks (-1.18%). This is consistent with the finding of a high average annual size premium of 7.54% (see Table 4, Panel B).

Analysis of the small-cap neutral stocks, however, provides an inconsistent picture. As Table 4, Panel B, shows, the migration of small-cap neutral and small-cap value stocks to the “Minus” group contributes 5.79% and 0.33%, respectively, to the average annual size premium. To be consistent with momentum, small-cap neutral stocks should have a higher average past 12-month return than small-cap value stocks. On the contrary, it is lower (SN -

1.18% vs. SV -0.8%), contradicting our hypothesis. Table 4, Panel B, shows the results. We conclude that momentum is not associated with the positive size premium contributed by small-cap neutral and small-cap growth stocks that migrate to the “Minus” group.

3.4.3 “Plus” group

Both small- and big-cap value stocks that migrate to the “Plus” group contribute greatly to the average annual value premium (4.19% and 8.99%, respectively). See Table 4, Panel B, for the results. If momentum drives the “Plus” stock migration, we should observe larger average past returns for both small-cap value and big-cap value stocks that migrate to the “Plus” group relative to their growth-stock counterparts. As Table 5, Panel A, shows, the average past 6-month return of small-cap value stocks that migrate to the “Plus” group (3.69%) is larger than the return for small-cap growth stocks (0%). This indicates that momentum might play a role in driving the value premium. This is also the case for big-cap stocks (SV 1.81% vs. SG 0.05%).

Table 4, Panel B, shows the analysis using past 12-month returns. Small-cap value stocks that migrate to the “Plus” group have a higher average past 12-month return (7.08%) than growth stocks (0%). The same applies for big-cap stocks (BV 3.72% vs. BG 0.16%). Based on the findings shown in Panels A and B, we conclude that momentum is associated with the positive value premium contributed by value stocks that migrate to the “Plus” group.

3.4.4 “dSize” group

As Table 4, Panel C, shows, small-cap stocks that grow to be big-cap contribute 1.46% of the average annual size premium (sum of: SV 0.31%, SN 1.23% and SG -0.08). If momentum is associated with this component of the size premium, then we should observe that small-cap stocks have high average past returns. Indeed, we find that small-cap stocks that grow to big-cap (SV 3.69%, SN 5.44% and SG 5.1%) tend to have high average past 6-month returns (see Table 5, Panel A). Past 12-month returns provide further support for

momentum (see Table 5, Panel B). Small-cap stocks that move to big-cap have high average past 12-month returns (SV 8.79%, SN 9.79% and SG 8.63%). Thus, momentum is associated with the component of the size premium that is driven by small-cap stocks that change size to big.

As Table 4, Panel C, shows, value stocks that change size contribute a small average annual value premium (SV 0.40% and BV 0.49%). To be consistent with momentum, value stocks (big- and small-cap) should have higher past 6- and past 12-month returns than growth stocks. However, as Table 5 shows, the results are conflicting. For small-cap stocks, they simply do not support our momentum proposition. As Panel A shows, the average past 6-month return for small-cap value stocks (3.69%) is lower than for small-cap growth stocks (5.1%). Panel B shows that small-cap value stocks and growth stocks have similar average past 12-month returns (SV 8.79% vs. SG 8.63%). While big-cap value stocks have negative average returns for both the 6-month (-0.52%) and 12-month (-3.21%) periods, these are better returns than the big-cap growth counterparts (-1.7% and -5.05%, respectively). See Table 5, Panels A and B, for these results. The results for big-cap stocks are consistent with our momentum proposition that value stocks should have a higher average past return than growth stocks.

As we previously found a positive average annual value premium (0.49%, see Table 4, Panel C), our findings regarding past returns are harder to interpret from an economic perspective. They imply that stocks with negative past returns are associated with a small positive contribution to the average annual value premium. Without further evidence to support our proposition on momentum, we conclude that momentum is not associated with the component of the value premium arising from stocks that change size.

4. Summary and conclusions

Previous research has documented strong size and value premiums in Australian stocks. Following FF (2007a), this study decomposes the annual size and value premiums by assessing the contribution of stock migration to the return premiums. These are our findings:

1) Both the size and value premiums are primarily due to the high returns of small-cap value stocks that stay in the same group from one year to the next.
2) Small-cap neutral stocks (and big-cap value stocks) that stay in the same group also contribute to the size premium (value premium). Their contribution is small, however, compared with that of small-cap value stocks that stay in the same group.
3) There is a tendency for small-cap neutral and small-cap growth stocks to deteriorate in type. Their deterioration is rewarded with higher returns relative to their big-cap counterparts. Consequently, this contributes moderately to the size premium.
4) Small-cap value stocks that deteriorate in type make a minor contribution to the size premium.
5) There is a tendency for value stocks to improve in type. This improvement in type is rewarded with a higher return relative to growth stocks. Hence, this contributes moderately to the value premium.
6) Small-cap value and small-cap neutral stocks that grow to become big-cap make minor contributions to the size premium.
7) Small-cap value stocks that grow to become big-cap and big-cap value stocks that shrink to become small-cap make minor contributions to the value premium.

FF (2007a) document that the value premium has three sources. Consistent with FF (2007a), we find that value stocks that improve in type tend to have high returns, and hence contribute to the value premium. This is not the case, however, for the other two sources that FF (2007a) report. Contrary to FF (2007a), we find that growth stocks that deteriorate in type

tend to have high returns; this contributes negatively to the value premium. Similar to FF (2007a), we find higher returns on value stocks that remain in the same group. However, we find that small-cap value stocks that stay in the same portfolio group tend to have a larger return compared to big-cap value stocks.

FF (2007a) report that the size premium is mainly due to the high returns of small-cap stocks that become big-cap in the following period. We find, however, that small-cap stocks that become big-cap in the following period make only a minor contribution to the size premium. Finally, the large return of small-cap value stocks that remain in the same group dominates both the size and value premiums in Australia; this is not observed in the US.

Our study is unique as we incorporate momentum into the investigation of migration of stocks that contribute to the size and value premiums. These are our momentum findings:

1) Momentum is not associated with the component of the size and value premiums caused by the small-cap value stocks that stay in the same portfolio in the next period.
2) Momentum is not associated with the component of the size premium caused by the small-cap neutral and small-cap growth stocks that deteriorate in type in the next period.
3) Momentum is associated with the component of the value premium caused by the value stocks (small- and big-cap) that improve in type in the next period.
4) Momentum is associated with the component of the size premium caused by the small-cap stocks that grow to big-cap in the next period.
5) Momentum is not associated with the component of the value premium caused by stocks that change size (small- to big-cap or big- to small-cap) in the next period.

Our findings have the following implications for investors:

1) Investors should invest in small-cap stocks (irrespective of type) but exclude stocks that are likely to improve in type (“Plus”) in the next period.

2) Investors should invest in value stocks (irrespective of size) but exclude stocks that are likely to deteriorate in type (“Minus”) in the next period.
3) To capitalise on both the high annual size and value premiums in Australia, we recommend that investors do the following:
    a. Invest in small-cap value stocks. This has a net positive effect on both the size and value premiums, irrespective of stock migrations.
    b. Invest in big-cap value stocks that tend to improve in type (“Plus”).
    c. Invest in small-cap growth stocks that tend to deteriorate in type (“Minus”).

So far, we have identified four different types of migration that contribute (positively or negatively) to the size and value premiums. We propose two possible extensions to this work. First, we could decompose the return of the migration portfolios into the dividend yield component and the capital gain component. This would provide deeper insights into the return characteristics that underlie the migration of stocks and that drive the size and value premiums. Second, FF (1995) claim that if the market is rationally priced, short-term variation in earnings should have little effect on stock returns. This study could be extended to provide a direct test of that proposition by forming portfolios of firms’ earnings on the migration portfolios. These extensions are left for future work.

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Table 1
Descriptive statistics

We form six value weight portfolios: SV, SN, SG, BV, BN and BG at the end of each December from 1990 to 2005. The portfolios are formed at the intersection of two size groups: small-cap (S, firms with December market capitalisation below the ASX median) and big-cap (B, above the median), and three market-to-book (M/B) groups: value (V, bottom 30%), neutral (N, middle 40%) and growth (G, top 30%). Value-weight returns of the six size-M/B portfolios are calculated from January to December of year t, that is, from 1991 to 2006. SMB is the difference, each month, between the average returns on the three small-cap portfolios (SV, SN and SG) and the average returns on the three big-cap portfolios (BV, BN and BG). HML is the difference, each month, between the average returns on the two low-M/B portfolios (SV and BV) and the average returns on the two high-M/B portfolios (SG and BG). We use market capitalisation in December of year t-1 to form the size groups and market capitalisation in December t-1 and book equity in fiscal year t-1 to form the M/B groups. Market capitalisation is obtained from the CRIF database. Book equity, defined as total equity minus total intangibles minus R&D expenditure, is obtained from the Aspect Huntley database.

	SV	SN	SG	BV	BN	BG	SMB	HML
Mean	0.0289	0.0256	0.0200	0.0160	0.0144	0.0083	0.0119	0.0083
Mean std. error	0.0052	0.0054	0.0068	0.0034	0.0028	0.0027	0.0048	0.0028
t-Statistic	5.5241**	4.7154**	2.9602**	4.6615**	5.0458**	3.1278**	2.4770*	2.9663**
Median	0.0219	0.0194	0.0152	0.0148	0.0187	0.0117	0.0017	0.0062
Maximum	0.2641	0.2857	0.3570	0.2920	0.1156	0.1061	0.2443	0.1888
Minimum	-0.2546	-0.2285	-0.3065	-0.1079	-0.0935	-0.1353	-0.2793	-0.1575
Std. dev.	0.0725	0.0752	0.0937	0.0475	0.0394	0.0369	0.0668	0.0387
Skewness	0.1061	0.1685	0.2765	0.9932	-0.2680	-0.5552	0.1323	0.0313
Kurtosis	4.4365	3.8356	4.3451	8.5781	2.9898	3.8813	4.7026	6.0952

*Significant at the 5% level
**Significant at the 1% level

Table 2
Average annual proportions - migration portfolios

We form six value weight portfolios: SV, SN, SG, BV, BN and BG at the end of December t-1 of each year. The portfolios are formed at the intersection of two size groups: small-cap (S, firms with December market capitalisation below the ASX median) and big-cap (B, above the median), and three market-to-book (M/B) groups: value (V, bottom 30%), neutral (N, middle 40%) and growth (G, top 30%). We use market capitalisation in December of year t-1 to form the size groups and market capitalisation in December of year t-1 and book equity in fiscal year t-1 to form the M/B groups. Market capitalisation is obtained from the CRIF database while book equity (defined as total equity minus total intangibles minus R&D expenditure) is obtained from the Aspect Huntley database. We exclude companies with negative and missing book equity in t-1 and companies that do not trade in December of year t-1. Stocks that are allocated to one of the six portfolios can (i) remain in that portfolio in December of year t, (ii) move to one of the other five portfolios, or (iii) move to one of the four outside groups. "Good Delist" stocks stop trading between December of year t-1 and December of year t because they are acquired by or merged with another firm (CRIF delisting codes A and M). "Bad Delist" stocks stop trading for all other delisting reasons, such as failure to pay listing fees, liquidation, demerger, etc (all of the CRIF delisting codes, except for A and M). "Neg" is for firms with negative book equity in period t. "NA" is for firms with missing book equity in period t. The allocation of a group of stocks from the six size-M/B portfolios in December of year t-1 to one of the 10 possible groups in December of year t is called a migration portfolio. There are 10 possible outcomes for stocks to migrate to from each of the six size-M/B portfolios at December of year t-1, creating a total of 60 migration portfolios. Panel A shows the time-series average of the fraction of migration portfolios' market capitalisation relative to total market capitalisation (that is, value weighted) in the size-M/B portfolios in December of year t-1. Panel B shows the time-series average of the fraction of stocks in the migration portfolios relative to the total number of stocks (that is, equal weighted) in the size-M/B portfolios in December of year t-1. The overall sum of the 10 migration portfolios for each row in Panels A and B is 100%. The test period is 1991 to 2006.

Panel A: Average annual value-weight proportion (%)

		December t									
		Movement within the group						Movement outside the group			
		SV	SN	SG	BV	BN	BG	Good delist	Bad delist	Neg	NA
December t-1	SV	63.80	18.15	3.00	3.19	7.12	2.68	0.00	0.00	1.63	0.43
	SN	20.21	46.96	12.25	0.30	8.07	10.00	0.00	0.00	2.08	0.11
	SG	5.24	30.05	41.83	0.20	1.65	13.60	0.00	0.01	7.10	0.31
	BV	1.89	0.14	0.07	55.02	40.51	0.43	0.00	0.00	0.47	1.47
	BN	0.16	0.07	0.02	7.71	76.81	15.11	0.00	0.00	0.13	0.00
	BG	0.05	0.17	0.10	1.06	24.69	72.43	0.05	0.05	1.42	0.00

Panel B: Average annual equal-weight proportion (%)

		December t									
		Movement within the group						Movement outside the group			
		SV	SN	SG	BV	BN	BG	Good delist	Bad delist	Neg	NA
December t-1	SV	62.01	21.99	6.16	1.32	3.65	2.25	0.00	0.00	2.13	0.48
	SN	19.65	46.88	18.35	0.21	4.38	7.47	0.00	0.00	2.82	0.24
	SG	5.05	28.35	47.07	0.12	1.10	9.12	0.00	0.04	8.79	0.37
	BV	10.81	0.97	0.16	59.56	25.19	1.88	0.00	0.00	0.82	0.62
	BN	5.88	3.30	0.67	14.72	61.76	12.87	0.00	0.02	0.69	0.10
	BG	1.55	5.31	3.51	1.65	22.51	61.75	0.03	0.03	3.68	0.00

Table 3
Average annual returns - migration portfolios

For detailed narrations, refer to Table 2. The annual return of the migration portfolio is the sum of the 12 monthly returns in period t. The monthly return is the value weight continuously compounded monthly returns of stocks allocated to the migration portfolio. The table shows the time-series average of the migration portfolios' annual raw returns (in percentage terms). If a stock is delisted, the post-delisting monthly returns of the stock are augmented with zero. The test period is 1991 to 2006.

		December t									
		Movement within the group						Movement outside the group			
		SV	SN	SG	BV	BN	BG	Good delist	Bad delist	Neg	NA
December t-1	SV	37.45	27.84	6.39	8.04	9.30	-7.83	0.00	0.00	24.30	3.56
	SN	40.90	30.69	12.66	1.94	3.78	1.40	2.60	0.00	-2.31	-9.56
	SG	0.19	24.76	14.43	4.83	10.18	-0.41	0.00	0.00	6.89	-5.41
	BV	17.74	3.42	0.90	16.73	23.23	6.96	2.59	3.02	-3.14	-0.80
	BN	15.08	9.82	0.99	15.85	16.44	12.80	1.75	-2.77	22.85	0.42
	BG	5.05	15.58	11.90	4.21	7.16	10.53	0.74	0.83	13.44	0.00

Table 4
Average contribution of the summarised migration portfolios

For each of the six size-M/B portfolios formed in December t-1, we group the 10 corresponding migration portfolios into 4 summarised categories. Overall, we group the 60 migration portfolios into 24 summarised migration portfolios. "Minus" includes stocks in a portfolio that: (i) move to a lower M/B portfolio in the same size group, (ii) move to the "Bad Delist" group (for description, see Table 2) or (iii) move to the "Neg" group (see Table 2). "Same" includes stocks that: (i) stay in the same size-M/B portfolio when it is formed in December of year t-1 and when it is reformed in December of year t or (ii) move to the "NA" group (see Table 2). "Plus" includes stocks in a portfolio that: (i) move to a higher M/B portfolio in the same size group or (ii) move to the "Good Delist" group (see Table 2). For a small-cap stock portfolio (SV, SN, or SG), "dSize" includes stocks that move to any big-cap stock portfolio (BV, BN or BG). For a big-cap stock portfolio (BV, BN or BG), "dSize" includes stocks that move to any small-cap stock portfolio (SV, SN or SG).

The average proportion of the summarised migration portfolios is the time-series average of the fraction of the total market capitalisation of stocks in the size-M/B portfolio when formed in December of year t-1 that falls into each of the four summarised migration portfolios ("Minus," "Same," "Plus" or "dSize") in December of year t. The annual return of the summarised migration portfolios is the sum of the 12 monthly returns of the summarised migration portfolios in period t. The monthly return is the value weight continuously compounded monthly returns of stocks allocated to the summarised migration portfolio. The average annual return of the summarised migration portfolios is the time-series average of the annual returns.

The contribution to the annual returns of the size-M/B portfolios in December of year t is the annual proportion of the summarised migration portfolios multiplied by the annual return of the summarised migration portfolios. Panel A reports the time-series average of the annual contribution to the average annual return of the size-M/B portfolios. The total contribution to the average annual return of the size-M/B portfolios is the sum of the four summarised migration portfolios' average contributions. SMB is the difference between the average returns of the three small-cap portfolios (SV, SN and SG) and the average returns of the three big-cap portfolios (BV, BN and BG). HML is the difference between the average returns of the two low-M/B portfolios (SV and BV) and the average returns of the two high-M/B portfolios (SG and BG). Panel B reports the time-series average of the annual size and value premiums for the "Minus", "Same", "Plus" summarised migration portfolios. Panel C reports the time-series average of the annual size and value premiums for the "dSize" summarised migration portfolios The test period is 1991 to 2006.

Panel A: Average contribution of the summarised migration portfolios to the average annual returns of the size-M/B portfolios (%)

		Average annual proportions (%)				Average annual returns (%)				Average contribution to the average annual returns of the size-M/B portfolios (%)				Total contribution to the average annual returns (%)	Average annual return premiums (%)	
		December t				December t				December t				December t		
		Minus	Same	Plus	dSize	Minus	Same	Plus	dSize	Minus	Same	Plus	dSize	Portfolio	SMB	HML
December t-1	SV	1.63	64.23	21.15	12.99	24.30	37.17	25.34	6.33	0.38	25.12	4.19	0.31	30.01	8.52	10.77
	SN	22.30	47.07	12.25	18.38	32.91	30.66	12.65	5.51	6.85	14.85	2.30	1.23	25.22		
	SG	42.41	42.14	0.00	15.45	23.64	14.29	0.00	1.26	9.74	7.64	0.00	-0.08	17.30		
	BV	0.47	56.49	40.94	2.10	-0.12	16.72	22.74	19.60	0.05	9.78	9.00	0.50	19.33		
	BN	7.84	76.81	15.11	0.24	17.09	16.44	12.83	15.62	1.06	12.94	3.09	0.04	17.13		
	BG	27.21	72.43	0.05	0.31	8.56	10.53	0.74	19.30	2.20	8.29	0.01	0.02	10.51		

Panel B: Average contribution of "minus", "same", "plus" to the average annual size & value premiums (%)

		Minus	Same	Plus
SMB	SV - BV	0.33	15.34	-4.80
	SN - BN	5.79	1.90	-0.79
	SG - BG	7.54	-0.65	-0.01
HML	SV - SG	-9.36	17.48	4.19
	BV - BG	-2.15	1.49	8.99

Panel C: Average contribution of "dSize" to the average annual size & value premiums (%)

		dSize
SMB	SV	0.31
	SN	1.23
	SG	-0.08
	BV	0.50
	BN	0.04
	BG	0.02
HML	SV - SG	0.40
	BV - BG	0.49

Table 5
Average past returns of the summarised migration portfolios

For each of the six size-ME/BE portfolios in December of year t-1, we group the 10 corresponding migration portfolios into four summarised portfolios. Overall, we group the 60 migration portfolios into 24 summarised migration portfolios.

"Minus" includes stocks in a portfolio that: (i) move to a lower ME/BE portfolio in the same size group, (ii) move to the "Bad Delist" group (for description, see Table 2) or (iii) move to the "Neg" group (see Table 2).

"Same" includes stocks that: (i) stay in the same size-ME/BE portfolio when it is formed in December of year t-1 and when it is reformed in December of year t or (ii) move to the "NA" group (see Table 2).

"Plus" includes stocks in a portfolio that: (i) move to a higher ME/BE portfolio in the same size group or (ii) move to the "Good Delist" group (see Table 2).

For a small-cap stock portfolio (SV, SN, or SG), "dSize" includes stocks that move to any of the big-cap stock portfolios (BV, BN, or BG). For a big-cap stock portfolio (BV, BN, or BG), "dSize" includes stocks that move to any of the small-cap stock portfolios (SV, SN, or SG).

The past return of the summarised migration portfolio is calculated by summing the value weight, monthly past 6 (or 12) month returns prior to portfolio formation in December t-1. We exclude the latest 1-month past return (that is, the stock returns in December of year t-1) to reduce the bias from bid-ask bounce. Panel A shows the time-series average of the summarised migration portfolios' past 6-month returns. Panel B shows the time-series average of the summarised migration portfolios' past 12-month returns. The test period is 1991 to 2006.

Panel A: Average past 6-month returns (%)

		December t			
		Minus	Same	Plus	dSize
December t-1	SV	0.94	1.50	3.69	3.69
	SN	0.09	1.83	3.86	5.44
	SG	0.64	2.46	0.00	5.10
	BV	0.03	0.71	1.81	-0.52
	BN	-0.77	0.38	1.43	-1.27
	BG	-0.40	0.72	0.05	-1.70

Panel B: Average past 12-month returns (%)

		December t			
		Minus	Same	Plus	dSize
December t-1	SV	-0.80	1.83	7.08	8.79
	SN	-1.18	1.79	6.31	9.79
	SG	0.75	3.43	0.00	8.63
	BV	-2.38	0.99	3.72	-3.21
	BN	-1.77	1.11	3.37	-3.91
	BG	-0.41	1.73	0.16	-5.05