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Should short selling be banned during periods of market turmoil?
MICHAEL D. MCKENZIE

During times of market turmoil, market regulators are often called upon to ban short selling. This paper considers a number of arguments commonly used to justify banning, which revolve around issues of volatility, stability, market abuse and settlement disruption. A literature review focusing on the 2008 period provides little evidence to support these arguments against short selling, suggesting that regulators should be circumspect when considering any future bans.

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Can mutuals compete on commercial bank terms? Sharpening the regulatory focus
NECMI KEMAL AVKIRAN SA Fin and DAVID W.L. TRIPE SF Fin

Prompted by the Treasurer’s December 2010 announcement promoting the growth of the credit unions and building societies (CUBS) as a ‘fifth pillar’ of banking, this study investigates the relative financial efficiency of banks and CUBS. Based on the efficiency measure we use, we find that: banks are more efficient than CUBS; efficiency fell during the GFC; efficiency and profitability ratios are not highly correlated; and there is no strong evidence that economies of scale explain efficiency differences.
Open and closed analyst briefings: an intraday perspective
TERRY WALTER and ZACHARY CORONES
This study examines the role of analyst briefings in the Australian share market, an area that has come under increased regulatory scrutiny. We identify the population of disclosed analyst briefings between 1999 and 2008, and analyse intraday ASX pricing data around the analyst briefing and contemporaneous earnings announcement events. Using abnormal trading activity as a proxy for information disclosure and a unique measure of informed trading, we make a number of interesting findings. Overall, we find that closed briefings allow earlier price discovery than open briefings and without creating any evidence of profitable informed trading. The case for additional regulation is not supported.

The impact of residential property investment on portfolio performance
MAURICE PEAT F Fin and DANIKA WRIGHT
To identify the potential diversification benefits of residential property we extend a portfolio of traditional asset classes to include investment in residential property. We analyse the long-term price performances of domestic and international equities, government fixed income securities, listed property and Australian residential property, and construct return-maximising portfolios for given risk levels. Our results indicate that for every level of risk, a portfolio which includes residential real estate has a higher expected return than a portfolio without it. Given these findings, particularly the relative stability of returns on residential real estate and its demonstrated low correlation with other assets — especially equities — the current lack of investment vehicles in the residential real estate asset class is surprising.

Stock returns and holding periods
BIN LI, BENJAMIN LIU, ROBERT BIANCHI F Fin and JEN JE SU
While it is generally accepted that equities achieve higher returns than fixed interest on average over the longer run, recent financial market volatility and poor equity performance have raised questions about the required holding period. Our study addresses this issue by examining US stocks and Treasury bills from 1963 to 2011. We find that a 15-year holding period is required to ensure a 95 per cent probability that stocks will outperform the risk-free rate of return. And, for large market capitalisation stock portfolios (favoured by pension funds) the investment horizon is even longer.
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We trust that you will enjoy reading this issue of the journal and we would appreciate your feedback at JASSAcontent@finsia.com.

SCOTT DONALD
Faculty of Law
University of New South Wales
This issue of JASSA contains a number of excellent papers which are particularly pertinent to the current financial situation facing the Australian economy and the regulatory issues arising from this.

Bans on short selling were implemented in many countries including Australia at the height of the global financial crisis (GFC) in 2008. The issue again became an important topic of debate following further market turmoil last year that saw bans being introduced in some European countries in August 2011. Michael D. McKenzie examines the common rationales provided for short selling bans during market turmoil, such as concerns about excessive volatility, market stability, market abuse and settlement disruption. His analysis and review of empirical studies examining the 2008 period provides little evidence to support these arguments against short selling and he suggests that regulators should be circumspect when considering any future bans. He also notes that there are many reasons for short selling beyond speculative trading such as risk management, market making and non-directional trading strategies which imposition of such bans disrupt.

Also of current interest is the issue of seasoned (secondary) equity raisings by Australian companies, with the ASX releasing a proposal to allow smaller companies to raise larger amounts through placements. One factor behind this proposal is the view that the cost of alternative capital raising methods, such as rights issues, is high. In that context, the study by Katherine Warren and Bill Dimovski is particularly relevant. They find that from 2001 to 2006 the direct capital raising costs of Australian renounceable equity rights issues averaged nearly 4 per cent of gross proceeds raised. Costs were higher for smaller issues and more risky companies, and increased as the percentage underwritten increased, but declined as ownership concentration increased.

As the Australian Government continues to promote the growth of credit unions and building societies (CUBS) as a fifth pillar of banking, the paper by Necmi Avkiran SA Fin and David W.L. Tripe SF Fin investigating the relative financial efficiency of banks and CUBS provides some interesting public policy insights. Based on the particular efficiency measure that they use, the authors find that: banks are more efficient than CUBS; efficiency fell during the GFC; efficiency and profitability ratios are not highly correlated; and there is no strong evidence that economies of scale explain efficiency differences.

Concerns about corporate disclosure were sufficient to lead to a Corporations and Markets Advisory Committee (CAMAC) review and report in 2009 into the role played by analyst briefings and their effects. While that review concluded that there was no need for changes to regulation, it did not present empirical evidence on how such briefings affected market efficiency. The study by Terry Walter and Zachary Corones seeks to rectify that gap, noting that regulatory recommendations should be evidence based. They examine the population of disclosed analyst briefings between 1999 and 2008, and analyse intraday ASX pricing data around the analyst briefing and contemporaneous earnings announcement events. They find that closed briefings allow earlier price discovery than open briefings and without creating any evidence of profitable informed trading, which does not support the case for additional regulation.
Next, Maurice Peat F Fin and Danika Wright look at the impact of residential property investment on portfolio performance. Their results indicate that for every level of risk, a portfolio which includes residential real estate has a higher expected return than a portfolio without it. Given these significant diversification benefits, Peat and Wright note that the current lack of investment vehicles in the residential real estate asset class is surprising, but they suggest that housing derivatives may be one solution to this. One issue arising from this study is the extent to which asset allocation of superannuation portfolios should take into account their members’ substantial direct investments in residential real estate.

It is generally accepted that over the longer run, equities beat fixed interest in terms of average returns. But recent financial market volatility and poor equity performance has brought to the fore the question of how long is necessary before we can be confident of that outcome. Bin Li, Benjamin Liu, Robert Bianchi F Fin and Jen Je Su address this specific issue using US daily data from 1963 to 2011 for equity and Treasury bill returns. They find that the long run is indeed long, with a 15-year holding period being required to be 95 per cent confident that equities outperform. Moreover, for portfolios of large market capitalisation stocks (typically favoured by pension funds) even longer is required.

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SHOULD SHORT SELLING BE BANNED DURING PERIODS OF MARKET TURMOIL?

During times of market turmoil, market regulators are often called upon to ban short selling. This paper considers a number of arguments commonly used to justify banning, which revolve around issues of volatility, stability, market abuse and settlement disruption. A literature review focusing on the 2008 period provides little evidence to support these arguments against short selling, suggesting that regulators should be circumspect when considering any future bans.¹

Short selling is a trading strategy designed to profit from falling asset prices. It involves the sale of an asset that the trader either does not hold at the time of the sale (a ‘naked’ short sale) or has borrowed in order to fulfil his or her settlement obligations (a ‘covered’ short sale). Where the asset is vested, the loan typically is collateralised with either cash or some other form of asset (see King 2005 for details on the operation of the securities lending market in Australia). A vast securities lending market exists to facilitate short sales and Faulkner (2007) conservatively estimates that the securities on loan globally exceed £3 trillion.

There is a vast theoretical and empirical literature which provides support for short-selling as a market practice that increases the efficient operation of asset markets (McKenzie 2012). Nevertheless, short selling is an extremely controversial practice and financial market regulators are ambivalent about it. They often espouse the eulogistic view that short selling is essential to the efficient processing of information in asset markets. For example, US Securities and Exchange Commission (SEC) Commissioner Kathleen Casey has indicated that short selling plays an ‘important and valuable role … in our market’.² Similarly, the NASDAQ views short selling as a ‘legitimate trading strategy’.³ In Australia, the Chairman of the local regulator, Greg Medcraft, recently noted that ‘ASIC sees short-selling as a legitimate business in the market’.⁴ Also, the UK FSA (Financial Services Authority 2002, p. 4) has stated that its ‘assessment of short selling remains that it is a legitimate investment activity, which plays an important role in supporting efficient markets’.

On the other hand, market regulators often resort to banning short selling, particularly during periods of market turmoil.⁵ For example, on 19 September 2008, Australian authorities announced an across-the-board ban on naked short sales, which was quickly modified to a ban on all short selling by the time the announcement came into operation on 22 September (although this was also quickly revised to allow some exceptions). On 19 November 2008, the bans were lifted for all non-financial securities and all bans were lifted on 25 May 2009.

Popular support for these bans is easily garnered since companies often publicly blame short sellers for their falling share prices. For example, ABC Learning Centre CEO Eddy Groves said that the practice of short selling was, ‘sad for Australia’.⁶ Further, NAB Chief Executive John Stewart commented that major listed stocks were hostage to the trading strategies of global hedge funds.⁷ Short selling has been linked to almost every financial crisis, including the current one, and short sellers tend to have a poor reputation. Rothchild (1998) observes that ‘[k]nown short sellers suffer the same reputation as the detested bat. They are reviled as odious pests, smudges on Wall Street, pecuniary...
vampires’. In a similar vein, Jickling (2005) notes that ‘[s]hort sellers have always been unpopular on Wall Street. Like skeletons at the feast, they seem to oppose rising values, increasing wealth, and general prosperity’.

Faced with the prospect of further declines in the equities market as the sovereign debt crisis plays out, regulators are likely to face further calls to ban short selling in the near future. The purpose of this paper is to critically examine some of the arguments that are often made against short selling.

It is worth noting at the outset that while many markets banned short selling in 2008, some did not (including Finland, Sweden, Hong Kong and New Zealand) and China introduced short selling at the time. Each of these markets continued to operate in an orderly fashion during the 2008 crisis and the continued presence of short sellers did not cause their downfall. Further, from a brief survey of the literature focusing on the 2008 period, there is little evidence that the bans reduced volatility (see Marsh and Niemer 2008; Bris 2008; Lioui 2009; FSA 2009; Boulton and Braga-Alves 2010; Saffi and Sigurdsson 2011) and may even have made it worse (see Boehmer et al. 2009; Charoenrook and Daouk 2009). Evidence from the Australian market (Helmes et al. 2009; Hamson 2008) is consistent with the international evidence. In light of this evidence, it is interesting to note that the outgoing Chairman of the SEC, Christopher Cox, admitted that the 2008 short selling bans were the ‘biggest mistake’ of his term.8 Further, SEC Commissioner Kathleen Casey has publicly expressed her view that the bans created ‘significant disruption and distortions’ in the market.9

A key difficulty in assessing the impact of short selling is that little is known about short sellers and their activities. The commonly held view is that all short selling is speculative in nature and is utilised solely to profit from price falls. The reality is that the motives for short selling are not well known and the only hard evidence comes from a 1947 survey of the NYSE in which two-thirds of short selling were found to be speculative (SEC 1963, p. 249). Financial markets have changed considerably since that time. Short selling is now integral to the risk management strategy of many market participants. Market makers also rely heavily on short selling and many market neutral trading strategies require short positions. As such, the speculative component of short selling is likely to be considerably less in the modern era.

The arguments against short selling

Short selling exacerbates price volatility

The most commonly cited argument against short selling is that it exacerbates stock price volatility. The logic behind this view is fairly straightforward: when there is bad news for a stock, short sellers increase their positions, i.e. they sell. Of course, the reverse is true for good news. Thus, short sellers’ trading activity is seen as adding further pressure to prices, resulting in increased volatility. This view was commonly advanced by regulators to explain the motivation for the 2008 short selling bans. For example, ASIC indicated that it was ‘concerned that the recent market global conditions, coupled with extensive short selling of stocks, particularly financial stocks, may be causing unwarranted price fluctuations’.10

There are a number of points that need to be taken into account when considering the validity of this argument. First, short selling is an extremely risky trading strategy which does not require any collateral. Second, some traders take long positions in stocks known to be sold short (Shao and Weiss 1991; Faust 2005). This is known as a short squeeze and it counters the short sellers’ impact on the market by creating offsetting long positions. Finally, many other participants also buy stocks following good news and sell on the back of bad news, yet there are never calls to ban momentum and non-contrarian technical traders from the market. Some advocates argue that there is a key difference in that short sellers are selling something they don’t own. However, the same argument may be made with respect to traders who borrow money to take long positions as they too are buying something that technically they don’t own until such time as the loan is repaid. And, given that short sellers typically have to put up more than 100 per cent of the trade value in collateral, it is possible to argue in favour of short selling over leveraged momentum trading which does not require any collateral.

Short selling destabilises the markets

A second argument commonly made against short selling takes a more macro view that short selling destabilises the market. For example, in 2010, the Chairman of the SEC, Mary Schapiro, stated that the SEC was concerned that unconstrained short selling could ‘destabilize our markets and undermine investor confidence’.11

To put this argument into context, consider Figure 1 which shows the Hong Kong Hang Seng market index as well as the daily total short sales volume for all stocks in the index over the period from January 2001 to April 2006. The Hong Kong market was chosen because it provides a long and reliable source of short sales data at a daily frequency. The figure clearly highlights two salient points. The first is that short sellers are always active in the market. If we accept the proposition that short sellers destabilise the market, then their continual presence means that markets
are always less stable than would otherwise be the case. This proposition has not been substantiated and it is more likely that the periods of abnormal short selling activity are the main area of concern for critics. Figure 1 reveals a number of spikes in the level of short selling activity and many of them correspond with periods in which the market is falling. Other such spikes, however, coincide with reversals in the market (in particular, during the early part of the sample) and even occur during periods in which the market is rising. Thus, it is not clear that episodes of heightened short selling lead to falls in the market. Even at the individual stock level it is unclear that high levels of short selling activity translate into negative returns (Boehmer et al. 2008; Boehmer et al. 2010).

Short selling leads to disorderly markets
The Chief Executive of the UK FSA, Hector Sants, justified the introduction of the short selling bans in 2008 by noting that ‘[w]hile we still regard short selling as a legitimate investment technique in normal market conditions, the current extreme circumstances have given rise to disorderly markets’ (FSA 2002, p. 4). In 2008, SEC Chairman Chris Cox argued that the short selling bans would, ‘not be necessary in a well-functioning market’. Such statements may be interpreted as suggesting some form of causality between short selling and ‘disorderly’ markets. It is unclear exactly what is meant by a ‘disorderly’ market in this context. While it may refer to a volatile or unstable market, as this issue has already been discussed, I will consider another possible interpretation. Specifically, the reference to a disorderly market may reflect the view that short selling magnifies the speed of the price correction following bad news. In this case, the argument centres on the notion that an immediate price response to bad news is undesirable and a more drawn-out and predictable response is preferred.

Efficient market considerations would certainly suggest that, while they may be disruptive and painful, there is a benefit associated with rapid asset price adjustments whereas the benefits of trying to achieve a slow adjustment (to an unknown new equilibrium price) are unproven. Further, in terms of the link between short selling and volatility, the current discussion raises the question of whether short selling leads to greater volatility or whether the market pressures just take longer to work themselves out when short selling is banned.

Short selling facilitates market abuse
In the early 1900s and again during the Great Depression, illegal bear raids were commonplace in the markets. This type of trading practice typically involved a coordinated effort among a group of traders who would short sell a stock (and often spread pernicious rumours) in an attempt to profit from the resultant decline in prices. Concerns over the practice led the SEC to introduce a number of new trading rules in 1938, which were designed to prevent the ‘use of the short sale by the “bear raider” to drive the market down’ (SEC 1963, p. 251). The most notable change was the introduction of the uptick rule to all short trades, which is largely credited with ending this practice.

FIGURE 1: Total daily short sales for the Hang Seng Index constituent stocks

![Figure 1: Total daily short sales for the Hang Seng Index constituent stocks](source: HKEX and Datastream)
During 2008, claims of bear raids were frequently used to support the case for short bans to be introduced. For example, the downfall of Bear Stearns was attributed to a bear raid by a number of hedge funds and Goldman Sachs (Burrough 2008). The wholesale and institutional markets Managing Director of the FSA, Sally Dewar, commented that ‘[t]here has been a series of completely unfounded rumours about UK financial institutions in the London market over the last few days, sometimes accompanied by short-selling’. More recently, the European Securities and Markets Authority justified the reintroduction of short selling bans in 2011, noting that it is clearly abusive when short selling is ‘used in combination with spreading false market rumours’.

With current levels of transparency and regulatory supervision of trading it is highly unlikely that short selling is used to facilitate market abuse in the form of a ‘bear raid’. It is more likely that the term is used in a sensationalistic sense to refer to a stock that has attracted the collective attention of a number of short sellers and is experiencing an unusually high level of short trading. The key point would seem to be whether prices fall in response to short selling or whether short sellers are reacting to market events such as a stock price falling following the release of bad news to the market. The impotence of the short bans in stopping stock prices from falling and reducing volatility certainly suggests that short sellers alone do not drive the market. It is much more likely that short sellers get swamped by long stock holders rushing for the exit and selling down their positions. By way of example, Data Explorers stock lending data reveals that six weeks prior to the collapse of HBOS, 18 per cent of available shares were on loan to short sellers. By the time of the collapse, however, this figure had fallen to only 2.75 per cent of available shares on loan.

Short selling disrupts the settlement process

The final argument against short selling considered in this paper is the notion that shorting selling disrupts the settlement process. For example, the IOSCO (2009) report on the regulation of short selling noted that ‘market regulators may also be concerned about the potential for short selling, particularly “naked” short selling, to create settlement disruption’.

Recall that when short selling, the trader may borrow the stock, make a corresponding purchase prior to settlement or make no delivery arrangements, in which case market buy-in rules are invoked. The disruption argument focuses on the latter two propositions and their possible impact on the settlement process. In terms of closing out positions intra-day, the argument can be equally applied to those day traders taking long positions, in which case a call for a ban on one might equally be applied to the other. The more serious concern focuses on the failure to deliver stocks and there is no evidence that short sellers are any more or less inclined than long traders to fail to deliver. The notable exception is market makers, who have been known to fail to deliver when stock is expensive or difficult to borrow (Boni 2006; Evans et al. 2009; Stratmann and Welborn 2010).

Conclusion

In 2008 and again in 2011, the latest rounds in a long history of short selling bans were invoked by market regulators. This paper examines a number of different justifications for short selling bans, focusing on concerns related to excessive volatility, market stability, market abuse and settlement disruption. From a literature review focusing on the 2008 period, there is little clear evidence to support any of these arguments, suggesting that regulators should be circumspect when considering whether to ban short selling.

It should be recognised that there are many reasons for short selling beyond speculative trading such as risk management, market making and non-directional trading strategies. Further, short selling bans may not yield the anticipated benefits in terms of reducing volatility and stabilising markets.
Notes
1. This paper represents a consolidated version of presentations given at the following industry forums: Macquarie Connections: Global Quant Conference, July 2010, Hong Kong; Data Explorers Security Financing Forum, October 2010, Hong Kong and November 2010, Dubai; the BNP Paribas Securities Lending Forum, January 2011, Singapore; and the Global Investor, Master Class, Asia Pacific Region 2012, Australia. The author would like to thank an anonymous referee and Kevin Davis for their helpful comments, and Steve Sedgwick for inspiring this article.

5. A review of the history of short sales restrictions may be found in Chancellor (2001). A summary of short selling regulations during the financial crisis may be found in Jain et al. (2012).
8. www.washingtonpost.com/wp-dyn/content/article/2008/12/23/AR2008122302765.html
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THE DIRECT COSTS OF RAISING EQUITY CAPITAL BY RENOUNCEABLE RIGHTS ISSUES in Australia

Rights issues continue to be a common means of raising equity capital for Australian companies listed on ASX. This study finds that from 2001 to 2006 the direct capital raising costs of Australian renounceable equity rights issues averaged nearly 4 per cent of gross proceeds raised. It also shows that issue size, percentage underwritten, concentration of ownership and issuer risk significantly influence the percentage direct costs of the rights issue.¹

A rights issue is one method available to a company that wishes to raise additional equity capital for reasons such as future growth, acquisitions or debt retirement. In a renounceable rights issue a company offers existing shareholders the right to purchase new shares on a pro rata basis to their current shareholding. Shareholders have three options available to them. They can accept the right to buy the additional shares and maintain their proportional stake in the company, or allow dilution of their existing proportional stake either by selling (renouncing) their right or by simply letting the right expire.

It is important for any potential issuing company to understand the costs involved in a renounceable rights issue. Higher direct and indirect costs increase the number of additional shares that need to be issued for a given amount of net proceeds required by the issuing company. The direct costs include legal, accounting, printing, stockbroking and underwriting costs, and are commonly measured as a percentage of gross proceeds raised. Indirect costs, such as adverse price reaction to issuance announcements are also incurred as a consequence of the rights issue. Studies on indirect costs have been undertaken by Owen and Suchard (2008) and Balachandran et al. (2008). Brown et al. (2006) and, later, Brown et al. (2009) report a significant level of longer-term underperformance of Australian seasoned equity issues, suggesting that managers may time seasoned equity offerings when equity prices are high. They also suggest that the quality of the entity’s corporate governance is positively related to its post-issue performance.

This study investigates the direct capital raising costs for Australian renounceable equity rights issues. This is important as rights issues continue to be a common method of raising equity capital in Australia. The study by Chan (1997) found that they accounted for 37.7 per cent of total equity capital raised by Australian Stock Exchange listed companies. More recently, Connal and Lawrence (2010) reported that slightly under $100 billion of equity capital was raised in Australia during 2008 and 2009 through 279 capital raisings. Renounceable rights accounted for around 15 per cent of the amount raised (and non-renounceable issues accounted for 30 per cent). It is worth noting that many private placements were also undertaken during this period (often to institutional investors), with some followed very quickly by rights issues. An issue for future research could be to examine the merits of alternative issuance methods, comparing the direct issue costs of these more recent accelerated issues with those of rights issues prior to the global financial crisis, as derived in this paper.

This study examines 130 renounceable rights issues for Australian Stock Exchange (ASX) listed companies from 2001 to 2006. The total direct costs of these rights issues averaged 4 per cent of gross proceeds raised. This figure is slightly less than the estimates of just over 5 per cent of gross proceeds, which were made by Armitage

Keywords: costs of raising capital, rights issues, equity capital.

1. For a detailed examination of the direct costs of raising equity through rights issues, see Armitage (2007).

As in Armitage (2000) and Martin-Ugedo (2003), this study finds that economies of scale are important in explaining the direct cost percentage. The proportion underwritten, ownership concentration and issuer risk also significantly influence these direct costs. These results are relevant to the debate surrounding the recent proposal by the Australian Securities Exchange² (2012) to allow smaller listed entities to issue more than the presently permitted 15 per cent of issued capital by way of private placement. However, while our results suggest that such firms face relatively higher direct costs for rights issues than larger firms, they do not provide information on the comparative (direct and indirect) costs of placements versus rights issues.

Related literature
Most US literature examines costs of seasoned equity issues other than rights issues, which have become infrequently used. An early-1970s US study by Smith (1977) found an average direct cost of 6.05 per cent for standby underwriting agreements and only 2.45 per cent for rights offerings without an underwriter. Lee et al. (1996) reported an average direct cost of 7.11 per cent for US issues in the early 1990s and found that utility offerings were significantly cheaper, averaging only 4.92 per cent. These two US studies both found substantial economies of scale. Corwin (2003) used a large sample of 4,454 US seasoned equity offerings from 1980 to 1998 and reported an average direct cost of 6.65 per cent.

Armitage (2000) studied 928 UK rights issues between 1985 and 1996 and found the average direct cost to be 5.78 per cent. After accounting for size categories of gross proceeds and the proportion of non-underwritten issues, he found that, on average, UK issues were 31 per cent cheaper than the US seasoned equity offerings reported in Lee et al. (1996). It is worth noting, however, that the seasoned equity offerings in the United States in more recent times are most likely general cash offerings (share sales to any investors) rather than rights offerings to existing shareholders. Martin-Ugedo (2003) examined 57 rights issues from 1989 to 1997 in the Spanish market and reported an average total direct cost of 5.78 per cent. Chen and Wu (2002) reported a very low average direct cost of 2.85 per cent in the Hong Kong market using a sample of 384 seasoned equity offerings between 1991 and 1996. Interestingly, economies of scale are not present in their results. It should be noted that in their study the underwriter component of direct costs was not explicitly given in many prospectuses.

Many studies have specifically considered the underwriting fee paid by issuing firms. Chan (1997) found underwriting fees averaged 1.71 per cent for Australian rights issues from 1987 to 1993, while Armitage (2000) reported an average underwriting cost of 1.53 per cent for UK rights issues. Contrary to some other studies, Armitage (2000) suggested underwriting costs represented the smaller part of total direct costs and did not exhibit economies of scale. However, he found that the variation in underwriting costs is due predominately to the proportion of the issue underwritten. In contrast, Lee et al. (1996) reported average underwriting costs of 5.44 per cent for US seasoned offerings. Similarly, Corwin (2003) reported the underwriter spread to be 5.32 per cent.

Armitage (2000) reported an average non-underwriting cost of 4.18 per cent for rights issues in the United Kingdom and found significant evidence of large economies of scale, which caused the economies of scale found in the total direct costs. In approximately two-thirds of cases, non-underwriting costs were greater than underwriting costs. His explanation for this result is that his sample consisted mainly of small issues thereby having relatively larger non-underwriting costs. In addition, he found solicitor and accountant fees were the largest components of the non-underwriting direct costs. Lee et al. (1996) and Corwin (2003) reported these other direct costs to be 1.67 per cent and 1.33 per cent of gross proceeds, respectively.

Direct cost influencing factors
Prior research has suggested several factors that can be expected to have an impact on the costs of raising equity capital.

Economies of scale
Martin-Ugedo (2003) suggested that the direct cost of raising capital (as a percentage of issue size) is a decreasing function of the size of gross proceeds raised by the firm. Such economies of scale are to be expected because equity raising firms should incur similar standard fixed costs and relatively constant or declining marginal costs as gross proceeds increase.

Armitage (2000) found this variable to be the most significant influencing factor in determining the total direct costs of rights issues in the United Kingdom. Martin-Ugedo (2003) found that the size of the issue in the Spanish markets was highly negatively related to total capital-raising costs. Many other studies support the hypothesis that economies of scale exist in the equity capital raising markets.

Percentage underwritten
While Smith (1977) and Armitage (2000) reported that underwriting costs influence the total direct costs in rights issues, Martin-Ugedo (2003) identified that the percentage underwritten has high explanatory power in determining the total cost of the issue.

Ownership concentration
Hansen and Pinkerton (1982) suggested total direct costs should decrease as ownership concentration increases. In relation to rights issues, if ownership is concentrated in a few investors, the administration and selling costs will be smaller. Less printing is required and share title transfer fees
are reduced. Overall, it is easier to organise and sell when ownership is concentrated. Martin-Ugedo (2003) found strong evidence that shareholder ownership concentration was negatively related to total costs. Other results which support the ownership concentration theory have been reported by Armitage (2000) in the United Kingdom and Hansen and Pinkerton (1982), Eckbo and Masulis (1992) and Hansen and Torregrosa (1992) in the United States.

Discount or underpricing
Armitage (2000) hypothesised that the deeper is the discount or underpricing, the lower is the underwriter fee and, hence also, the total direct cost of capital raising. This is because, with a large discount, the insurance and marketing underwriter costs should be lower. However, he found that the deeper the discount becomes, the higher total costs become. The argument behind this is that deep discounts (30 per cent or more) are not, on their own, a substitute for underwriting. Martin-Ugedo (2003) also found a lack of evidence to support the hypothesis that the larger is the discount the lower is the cost.

Issuer risk
Issuer risk is the total risk (systematic and firm-specific risks) of the issuing company. Armitage (2000) and Martin-Ugedo (2003) measured issuer risk as the standard deviation of company daily returns for one year prior to the announcement date. Armitage (2000) found issuer risk only accounts for a minor part of the costs. Martin-Ugedo (2003) did not find any explanatory power in this variable.

Data and models
All Australian renounceable rights issue prospectuses issued during the period January 2001 to December 2006 were collected from the Connect 4 — ASX Listed Company Intelligence database. The prospectuses provided the direct capital raising cost information that consists of the estimated total cost and its components, the underwriting, legal, accounting and other costs. In addition, the gross proceeds, prospectus date, percentage underwritten, new/old share ratio, attached options and the offer price of the rights issues were obtained from the prospectuses. A total of 130 Australian renounceable equity rights issues were identified.

FinAnalysis was used to collect the daily closing share price and the daily trading volumes data for each company. DataAnalysis was used to gather general company information including the age, sector and the percentage of ordinary shares held by the top 20 ordinary shareholders.

In brief, during the period from 2001 to 2006, a total of nearly $11 billion of new equity capital was raised by Australian companies using renounceable rights issues. And, underwriters were used in around four out of every five issues. The average offer-price discount from the current market price was around 17 per cent while total direct costs averaged around 4 per cent.

The results in Table 1 show that total direct costs are negatively related to proceeds and, hence, exhibit economies of scale. This is consistent with the equity capital raising literature.

Analysis of the variables that may influence the total direct cost of rights issues was conducted using the following regression model:

\[ T\text{COST} = \beta_0 + \beta_1 \ln \text{Procld} + \beta_2 \text{PerUdrw} + \beta_3 \text{Ownship} + \beta_4 \text{Disc} + \beta_5 \text{Risk} + \beta_6 \text{Options} + \varepsilon \]

\( TCOST \) is the total direct cost of rights issue capital raising as a percentage of gross proceeds, \( \ln \text{Procld} \) is the natural logarithm of the maximum amount to be raised from the issue when fully subscribed, \( \text{PerUdrw} \) is the percentage of the issue underwritten, \( \text{Ownship} \) is the percentage of ordinary shares held by the top 20 ordinary shareholders, \( \text{Disc} \) is the discount of the offer price from the closing market price the day before announcement date, \( \text{Risk} \) is the total risk of the issuing company measured as the standard deviation of daily returns for one year prior to the announcement date. \( \text{Options} \) is a dummy variable equal to 1 if the rights issue has an attached option to buy more shares and 0 if not. (This variable was found to be relevant in studies by Dimovski and Brooks (2004) in relation to initial public offering (IPO) underpricing and Ng and Smith (1996) in relation to its use with underwriters.)

Similar regression models are used to explore how these independent variables influence the three main components of total direct costs. (While there were 130 TCOST observations in aggregate, equation (2) considers only the underwritten observations and equations (3) and (4) consider the cases where these legal and accounting costs were identified.) These are as follows:

\[ \text{UDRWFEE} = \beta_0 + \beta_1 \ln \text{Procld} + \beta_2 \text{PerUdrw} + \beta_3 \text{Ownship} + \beta_4 \text{Disc} + \beta_5 \text{Risk} + \beta_6 \text{Options} + \varepsilon \]

\[ \text{LEGAL} = \beta_0 + \beta_1 \ln \text{Procld} + \beta_2 \text{Ownership} + \beta_3 \text{Disc} + \beta_4 \text{Risk} + \beta_5 \text{Options} + \varepsilon \]

\[ \text{ACCOUNT} = \beta_0 + \beta_1 \ln \text{Procld} + \beta_2 \text{Ownership} + \beta_3 \text{Disc} + \beta_4 \text{Risk} + \beta_5 \text{Options} + \varepsilon \]

\( \text{UDRWFEE} \) is the fee charged by the underwriter, \( \text{LEGAL} \) is the legal costs, \( \text{ACCOUNT} \) is the accounting costs all as a percentage of gross proceeds and all other terms are as previously defined.
This table shows the multivariate regression results for total direct underwriting, legal and accounting costs of rights issues using ordinary least squares. The coefficient and p-values (in parentheses) are reported for the constant, variables and regression diagnostics. Each regression model was conducted using the full sample and when outliers were removed. Reported figures are corrected for White (1980) heteroskedasticity. ***, **, * shows statistical significance at the 1%, 5% and 10% levels, respectively.

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<th>Dependent Variable (as % of proceeds)</th>
<th>No. of Obs.</th>
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<th>p-value</th>
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* Reported figures are corrected for White (1980) heteroskedasticity. ***, **, * shows statistical significance at the 1%, 5% and 10% levels, respectively.
Results

Table 1 reports the regression results for the total direct costs of the renounceable rights issue capital raising and for the underwriter, legal and accounting costs. If any of the dependent variables have observations over three-and-a-half standard deviations from the mean, these outliers were removed and the models were re-run. These results are also reported. Where heteroskedasticity was a concern, the models utilised White (1980), and corrected parameter and \( p \)-values are reported. Three standard regression diagnostic tests were completed and are also reported. The Jarque-Bera test assesses the distribution’s normality by comparing the distribution with that of a normal distribution. The White (1980) test examines observation variance and reports on heteroskedasticity. The Ramsey Regression Specification Error Test (RESET) test detects model misspecification by an omitted variable. \( R^2 \)-squared and adjusted \( R^2 \)-squared results are also reported.

The results in Table 1 show that total direct costs are negatively related to proceeds and, hence, exhibit economies of scale. This is consistent with the equity capital raising literature (see Smith 1977; Ritter 1987; Lee et al. 1996; Kooli and Suret 2002). The results also show that the percentage underwritten is significantly positively related to total direct costs (consistent with Martin-Ugedo 2003) and total direct costs are negatively related to concentrated ownership, suggesting cost economies to concentrated ownership (also consistent with Hansen and Pinkerton 1982). It appears that the discount is positively related to total direct cost but is only significant at the 10 per cent level once outliers are excluded, and this is consistent with Armitage (2000). The results of this study also provide strong evidence that risk is positively related to underwriting costs, also consistent with Armitage (2000). Options do not appear to be significant in influencing total direct costs.

Table 1 also indicates that gross proceeds are negatively related to underwriting costs, suggesting economies of scale in underwriting costs. As expected, the percentage underwritten is positively related to underwriting costs and is statistically significant at the 1 per cent level. It should be noted that those rights issues with an underwriter who was not at arm’s length (to the parent company, director’s other company or directors themselves) were excluded from the sample. It should also be noted that there are no underwriting cost outliers. Our results suggest that the risk variable is positively related to underwriting costs and this supports the hypothesis in Booth and Smith (1986) that underwriter certification costs increase as information asymmetry increases.

Table 1 also confirms a negative relationship between gross proceeds and legal and accounting costs, suggesting economies of scale in both. Once the outliers are removed, the discount variable is positively related to legal costs and is significant at the 5 per cent level.

It is worth noting that while risk is a determinant of underwriting costs, it does not appear to determine legal or accounting costs.

Conclusion

This paper adds to the international literature investigating potential influencing factors on the direct costs of renounceable equity rights issues by investigating Australian rights issues from 2001 to 2006. The results provide strong support for economies of scale in the direct costs of rights issue capital raising. The proportion of the issue underwritten, ownership concentration and issuer risk were also found to influence significantly the total direct costs, which averaged around 4 per cent of the proceeds.
References


Note

1. Acknowledgement: The authors would like to thank the Managing Editor, Kevin Davis, for helpful commentary that improved this paper.

2. The Australian Securities Exchange was formed from the 2006 merger of the Australian Stock Exchange and Sydney Futures Exchange.
Can Mutuals Compete on Commercial Bank Terms?

Sharpening the regulatory focus

Prompted by the Treasurer’s December 2010 announcement promoting the growth of the credit unions and building societies (CUBS) as a ‘fifth pillar’ of banking, this study investigates the relative financial efficiency of banks and CUBS. Based on the efficiency measure we use, we find that: banks are more efficient than CUBS; efficiency fell during the GFC; efficiency and profitability ratios are not highly correlated; and there is no strong evidence that economies of scale explain efficiency differences.

The Australian Federal Government has proposed re-regulation of the finance sector in order to address the reduction in competition following the global financial crisis (GFC) in 2007–08. One of the government’s key concerns is CUBS’ ability to compete with major banks on a ‘level playing field’. The proposed measures announced in December 2010 included: the Australian Prudential Regulation Authority (APRA) granting permission for CUBS to use the term ‘bank’; government facilitation of development of an aggregated structure to raise cheaper funds; and continued government investment in the securitised mortgages market.

CUBS account for about 9 per cent of new home loans (arguably with lower mortgage rates than the major banks), and are the fifth largest holder of household deposits (The Treasury 2010). Therefore, closer scrutiny of this sector’s positioning in the wider financial sector could contribute to the government’s overall efforts to foster stable, efficient and competitive institutions, with efficient operations a key prerequisite for this.

The government has encouraged CUBS to compete directly with banks and we have already seen some CUBS move to identify themselves as banks. The main motivation for this study is to evaluate the extent to which CUBS can compete with banks and our analysis employs variables commonly used to assess the financial performance of commercial banks. We undertake this evaluation over a five-year period (2006 to 2010), including the GFC, which was at its most severe in 2008, thus generating insights into the performance of these financial institutions in different economic conditions.

Benchmarking to identify best and worst practices

Competition makes it critical that managers develop a better understanding of their institution’s position relative to best practices found among competitors via benchmarking. This study investigates the financial efficiency or profitability of CUBS relative to banks and to each other. We are interested in investigating efficiency because efficient institutions are more capable of tolerating adverse economic conditions, as well as surviving in competitive markets. For example, regulators that monitor performance could conceivably consider permitting more leeway in a bank’s risk profiling exercise if they were satisfied about efficient operations and the implied quality of management. Studying efficiency over a five-year period also provides an opportunity to observe the stability of the Australian financial system.

It is often difficult to discover best or worst practices because simple gap analysis or traditional financial ratio analysis only provides a narrow focus and ignores interactions among multiple variables or trade-offs. The key statistical technique utilised in this study — data envelopment analysis (DEA) — is a multi-criteria decision making tool best known for its ability to capture the various interactions among multiple inputs and outputs.
outputs in a single value. According to Siems and Barr (1998, p.13), DEA has the key attributes expected of a useful benchmarking paradigm, namely, robust economic and mathematical underpinnings, alternative composite best practices, and the ability to capture trade-offs and substitutions while identifying potential improvements in multiple performance dimensions.

We envisage DEA-based financial efficiency analysis as an off-site monitoring instrument that may be of particular interest to regulators and complement existing bank examination procedures. Pille and Paradi (2002) report such a study in collaboration with the Canadian regulator, Deposit Insurance Corporation of Ontario, in which DEA was used to identify weaknesses in credit unions. The results indicate that DEA predicts failure better than, or at worst, comparable with what can be provided by the regulator’s modified Z-score. Such an application of DEA was anticipated much earlier by Barr et al. (1993, p.15). They note that ”[t]he efficiency scores obtained via DEA can be used by regulatory authorities to identify the most inefficient institutions which require the greatest need of attention”.

With this aim in mind, we proceed to outline the performance modelling approach adopted in our investigation.

The ‘global intermediation model’ of benchmarking

The performance perspective which we dub the global intermediation model (GIM) provides a bird’s-eye view of the relative success of an institution’s intermediation activities in converting expenses to income. In modelling financial efficiency through DEA, GIM brings together the inputs of interest expense ($), and the outputs of gross interest income ($) and non-interest income ($). Other studies which employ the same variables used in this study’s intermediation model include those by Miller and Noulas (1996), Avkiran (1999, 2000), Sturm and Williams (2004), and Banker et al. (2010).

DEA is an efficient frontier technique, based on linear programming, which computes a ratio of weighted outputs to weighted inputs for each organisation in a sample relative to ‘best practice’ implied from the others — reported as the relative efficiency estimate. The linear program scales the efficiency estimate between 0 and 1, thus enabling easy comparison, where 1 represents an efficient operation relative to others in the sample. Thus, a unit with a score of less than 1 is inefficient. This kind of frontier efficiency is also known as X-efficiency and it measures deviations from the frontier defined by the best-practice units.

A more detailed explanation of DEA can be found in a previous JASSA article (Avkiran 2006). In this study, we remove the upper truncation of 1 in efficiency estimates by employing super-efficiency DEA modelling — thus avoiding ranking ties among efficient units and enabling a more discriminating analysis (see the seminal paper by Andersen and Petersen (1993), as well as a more recent paper by Tone (2002)). Essentially, a frontier is established for assessing each institution’s relative efficiency while excluding the evaluated institution from the original frontier calculation. Hence, there is no single frontier and an institution can have an efficiency score greater than 1, for example, while increasing its inputs yet remaining efficient.

We also note that a unit’s efficiency measure is based on actual observed performance within the sample, rather than measures of central tendency or regression fitting. This approach provides a relative measure based on local or peer comparisons of how efficient each unit is in converting inputs to outputs designated in a conceptualised performance model. Note further that the DEA modelling used assumes variable returns-to-scale (VRS) due to the mixed sample. That is, efficiency estimates are computed after the effects of differences in scale have been adjusted for, so that the differences in efficiency are not a consequence of differences in the size of operations.3

The DEA technique used in this study enables a relative comparison based on the principle of simultaneously minimising inputs while maximising outputs. Those units that excel in this joint exercise relative to their peers are dubbed ‘efficient’. This places the best-performing institutions, or those most efficient in operating profitably, on the frontier. Relative financial efficiency (i.e. benchmarking) is executed using the global intermediation model with a panel data set for the period 2006 to 2010. Pooling of the balanced panel data set provides the opportunity for constructing a common frontier across five years. In turn, the common frontier places the focus of analysis onto both an individual institution’s performance over time and the performance of institutions overall.

We work with a single balanced sample of six banks, 10 credit unions and eight building societies, resulting in 120 observations in total across five years. Key features of the different institutions are reported in Table 1.

Because we are looking at the CUBS’ ability to compete with banks, we consider it reasonable to include all of the institutions in a single study, relative to a common frontier. We also note that all of the basic financial intermediation process, which is the primary driver of performance, is undertaken by all of the institutions. Similarly, all institutions need to earn profits: in the case of the mutuals, this is so that they can maintain and strengthen their capital bases.

The government has encouraged CUBS to compete directly with banks and we have already seen some CUBS move to identify themselves as banks.
TABLE 1: Sample means for size and key ratios

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<th>Building Societies</th>
<th>Credit Unions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size ($m)</td>
<td>328,394</td>
<td>3,222</td>
<td>2,092</td>
</tr>
<tr>
<td>Return on average assets (after tax)</td>
<td>0.84%</td>
<td>0.57%</td>
<td>0.85%</td>
</tr>
<tr>
<td>Regulatory capital adequacy ratio</td>
<td>10.9%</td>
<td>14.1%</td>
<td>16.1%</td>
</tr>
<tr>
<td>Equity ratio (assets not risk-weighted)</td>
<td>5.8%</td>
<td>5.6%</td>
<td>8.3%</td>
</tr>
</tbody>
</table>

Source: A list of the institutions included is provided in the Appendix.

Key findings

Noting the range of sizes among the institutions studied, we further examine scale inefficiency. We do this by running traditional radial constant returns-to-scale (known as the CCR model in DEA jargon) and variable returns-to-scale (BCC) models, with scale efficiency being measured as the CCR score divided by the BCC score. Results (available from the authors) show that the scale inefficiencies are generally very small, and of no economic significance. Testing for the statistical difference between the CCR and BCC scores (using the Mann-Whitney test) reveals that the differences between the banks and credit unions is not statistically significant, even at the 10 per cent level. Once building societies are introduced into the comparison, however, we find statistical significance at the 5 per cent level, even though the building societies are, on average, larger than the credit unions included in the study. Because of low scale inefficiency, and because we cannot be sure that some of the scale inefficiency identified is not a consequence of the relative dearth of smaller institutions in the study, we retain building societies in the study. The rest of our analysis continues with the originally planned VRS approach which avoids clouding our results with any scale effects.

While examining performance through GIM, our main focus is on understanding how well CUBS would fare when benchmarked against banks, as well as demonstrating how potentially problematic institutions can be empirically identified. Profiling of the sample on efficiency estimates across the 2006-10 common frontier indicates that the composition of the efficient cohort is almost evenly split between banks and CUBS; similarly, credit unions and building societies are equally represented in the latter group. We also note that the banks in the efficient cohort comprise about half of all bank observations across the five-year period. On the other hand, the bottom ranks do not include any banks and consist of a mix of credit unions and building societies.

How do financial institutions fare over the five-year study period? To answer this question more specifically, we return to the common efficient frontier constructed using 120 observations. Once the institutions are sorted in descending order of five-year average efficiency estimates, the major banks comprise four of the top five (with a credit union occupying the fourth position). There is no clear pattern as to the composition of the sorted institutions, except that we notice a stronger presence of building societies towards the bottom of the ranked list. Indeed, five out of six institutions at the bottom of the five-year average efficiency ranking are building societies. Five-year group average super-efficiency estimates are 0.9136 (banks), 0.7469 (credit unions) and 0.6508 (building societies). Testing for the significance of these differences using the Mann-Whitney test finds that banks are more efficient than both building societies and credit unions at the 1 per cent level, and that credit unions are more efficient than building societies at the 5 per cent level, thus lending further support to the preceding observations. Overall, we can therefore infer that banks perform substantially better than CUBS in terms of the global intermediation model of financial performance, and credit unions do better than building societies.

Having set the scene for competition between banks and CUBS, we now expand the analysis to examine the stability of performance of the Australian financial institutions over time. Intuitively, institutions should not exhibit a marked change in their ranking from one year to the next. Rank correlations are 0.790 (across 2006-07), 0.768 (2007-08), 0.536 (2008-09) and 0.804 (2009-10). These correlations are all statistically significant, showing the greatest change during the 2008-09 period, when the impact of the GFC would have been reflected in financial statements. Otherwise, the statistically significant and high rank correlations suggest a stable sector and, according to Bauer et al. (1998), lend support to a frontier approach that could be useful for regulatory analysis.

We also examine the impact of the GFC, with our expectation being that efficiency scores might have deteriorated as banks (in particular) faced relatively higher funding costs and (possibly) reduced opportunities for revenue generation with a slowing in growth. We see in Table 2 that efficiency scores were indeed consistently lower in 2009. With most of our institutions having June balance dates, this is the year in which we would expect the main impact of the GFC to be observed following the crunch in funding markets in September-October 2008.
Finally, we briefly investigate the association between efficiency estimates and key profitability ratios commonly used by practitioners. In the literature there is no common theme regarding correlations between DEA estimates and financial ratios. This is primarily attributed to the uni-dimensional nature of ratios versus the multi-dimensional nature of DEA where interactions among multiple variables are captured in a single score. As Gelade and Gilbert (2003) point out, individual ratios looking at different aspects of an organisation’s effectiveness cannot depict a full picture because ratios are unlikely to be independent. The most extensive and recent exploration of this relationship can be found in Avkiran (2011, p. 325) where it is reported that ‘The few researchers who have tested for the correlation between bank profitability and DEA scores sometimes report insignificant correlations and at other times report significant correlations’. Avkiran (2011) finds the profitability ratio of post-tax profits / average total assets is significantly correlated with various types of DEA estimates at a mean value of 0.553 (0.05 level of significance).

Table 3 reports rank correlations between DEA estimates and key profitability ratios (all significant at the 0.01 level, two tailed). Nevertheless, none of these correlations is very high, confirming anticipated findings. These observations suggest that an institution can be profitable in accounting terms but not necessarily technically efficient. It also highlights room for improvement where such disparity is found. Avkiran (2011, p. 323) states, ‘... a low correlation may present an opportunity to address production inefficiencies that were not obvious in financial ratio analysis, thus enabling an update of inferences drawn from ratios’.

**Concluding remarks**

Based on our empirical analysis of 24 Australian financial institutions over the 2006–10 period, we reach the following conclusions.

<table>
<thead>
<tr>
<th>Table 2: Comparison of efficiency estimates over time</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Mean efficiency – banks</strong></td>
</tr>
<tr>
<td>2006: 0.900</td>
</tr>
<tr>
<td>2007: 0.929</td>
</tr>
<tr>
<td>2008: 0.927</td>
</tr>
<tr>
<td>2009: 0.850</td>
</tr>
<tr>
<td>2010: 0.963</td>
</tr>
<tr>
<td><strong>Mean efficiency – CUBS</strong></td>
</tr>
<tr>
<td>2006: 0.768</td>
</tr>
<tr>
<td>2007: 0.706</td>
</tr>
<tr>
<td>2008: 0.719</td>
</tr>
<tr>
<td>2009: 0.622</td>
</tr>
<tr>
<td>2010: 0.706</td>
</tr>
<tr>
<td><strong>Mean efficiency – all</strong></td>
</tr>
<tr>
<td>2006: 0.801</td>
</tr>
<tr>
<td>2007: 0.761</td>
</tr>
<tr>
<td>2008: 0.771</td>
</tr>
<tr>
<td>2009: 0.679</td>
</tr>
<tr>
<td>2010: 0.770</td>
</tr>
<tr>
<td><strong>Median efficiency – banks</strong></td>
</tr>
<tr>
<td>2006: 0.966</td>
</tr>
<tr>
<td>2007: 0.997</td>
</tr>
<tr>
<td>2008: 1.007</td>
</tr>
<tr>
<td>2009: 0.935</td>
</tr>
<tr>
<td>2010: 1.013</td>
</tr>
<tr>
<td><strong>Median efficiency – CUBS</strong></td>
</tr>
<tr>
<td>2006: 0.802</td>
</tr>
<tr>
<td>2007: 0.740</td>
</tr>
<tr>
<td>2008: 0.712</td>
</tr>
<tr>
<td>2009: 0.623</td>
</tr>
<tr>
<td>2010: 0.704</td>
</tr>
<tr>
<td><strong>Median efficiency – all</strong></td>
</tr>
<tr>
<td>2006: 0.839</td>
</tr>
<tr>
<td>2007: 0.754</td>
</tr>
<tr>
<td>2008: 0.733</td>
</tr>
<tr>
<td>2009: 0.674</td>
</tr>
<tr>
<td>2010: 0.731</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 3: Rank correlations between efficiency estimates and profitability ratios</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spearman’s rho</td>
</tr>
<tr>
<td>-----------------</td>
</tr>
<tr>
<td>Post-tax profits / average total assets</td>
</tr>
<tr>
<td>Return on average assets (roa)</td>
</tr>
<tr>
<td>Return on average equity (roe)</td>
</tr>
</tbody>
</table>

> Half of all bank observations are in the efficient cohort. Similarly, the bottom ranks entirely consist of credit unions and building societies. It is possible that the GFC has put banks in a stronger relative position, because of their ability to access wholesale funding based on their stronger credit ratings. However, this would not explain their superior performance prior to the GFC.

> Five-year average efficiency estimates show that the major banks occupy four of the top five positions and the bottom ranks are dominated by building societies. This ranking is not disturbed by the effects of the GFC in 2009, which suggests that the ranking cannot be attributed only to differences in the mix of business. Otherwise, we would expect to see a stronger effect of the GFC on the major banks with their international linkages.

> Overall, we can infer that banks perform better than CUBS in terms of the global intermediation model of financial performance. That is, when benchmarked on commercial bank terms, CUBS perform poorly; this is particularly true for building societies. This matters because profitability is the source of additional capital needed to maintain financial strength (a particularly important issue for the majority of CUBS that are mutuals).

> There is scope to undertake further analysis to improve our understanding of CUBS performance. We note,
for example, that CUBS generally hold higher levels of equity capital: if capital were included as an input in our analysis, we would expect the results to show CUBS as even less efficient in relative terms (although there would be some trade-off because smaller external funding requirements would reduce their interest costs).

> Statistically significant and high correlations of efficiency rankings across multiple periods of two consecutive years mean that institutions’ efficiency scores were consistent through time — an indication of relative stability in the financial sector.

> The impact of the GFC is noticeable in lower mean and median efficiency estimates in 2009 across the mixed sample and its constituent sub-groups.

---

**Appendix: Institutional coverage and data sources**

**TABLE A1: Financial institutions in the study sorted in descending order of total assets as at end of financial year 2010 ($m)**

<table>
<thead>
<tr>
<th>Credit Unions (N=10)</th>
<th>Building Societies (N=8)</th>
<th>Commercial Banks (N=6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Credit Union Australia (8,155)</td>
<td>Heritage Building Society (7,565)</td>
<td>National Australia Bank Ltd (621,357)</td>
</tr>
<tr>
<td>Australian Central Credit Union (6,006)</td>
<td>Newcastle Permanent Building Society (6,838)</td>
<td>Commonwealth Bank of Australia (620,169)</td>
</tr>
<tr>
<td>Community CPS Australia (3,048)</td>
<td>IMB Limited (4,696)</td>
<td>Westpac Banking Corporation (606,717)</td>
</tr>
<tr>
<td>Police &amp; Nurses Credit Society (2,654)</td>
<td>Greater Building Society (4,226)</td>
<td>Australia and New Zealand Banking Group Ltd (491,263)</td>
</tr>
<tr>
<td>MECU Limited (2,433)</td>
<td>Wide Bay Australia Limited (2,725)</td>
<td>Bendigo and Adelaide Bank Ltd (521,41)</td>
</tr>
<tr>
<td>Qantas Staff Credit Union (1,993)</td>
<td>The Rock Building Society (1,225)</td>
<td>Bank of Queensland Ltd (38,571)</td>
</tr>
<tr>
<td>Victoria Teachers Credit Union (1,262)</td>
<td>Hume Building Society (705)</td>
<td>NECU (876)</td>
</tr>
<tr>
<td>Queensland Teachers Credit Union (1,124)</td>
<td>B&amp;E Limited (587)</td>
<td>Police Credit Union SA &amp; NT (563)</td>
</tr>
</tbody>
</table>

Data were obtained from annual reports and Bankscope (particularly for the building societies). We used consolidated data because, in most cases, subsidiaries are integral to institutions’ operations (even for the major banks where some overseas business is conducted through subsidiaries). The other adjustment made is in relation to the major banks’ insurance business, with insurance liabilities and expenses netted off against insurance assets and income, respectively, so that attention is given only to the banking business.
Notes
2. Queensland Teachers Credit Union, MECU and Heritage Building Society are among the CUBS who have relabelled themselves as banks.
3. Further technical details on DEA are available from the authors.
4. Individual institution estimates are available from the authors.
5. Bauer et al. (1998, p.87) dub this as a ‘consistent-with-reality condition’.
6. The full report and tabulated results used in writing this short article are not reproduced here but are available from the authors.

References
This study examines the role of analyst briefings in the Australian share market, an area that has come under increased regulatory scrutiny. We identify the population of disclosed analyst briefings between 1999 and 2008, and analyse intraday ASX pricing data around the analyst briefing and contemporaneous earnings announcement events. Using abnormal trading activity as a proxy for information disclosure and a unique measure of informed trading, we make a number of interesting findings. Overall, we find that closed briefings allow earlier price discovery than open briefings and without creating any evidence of profitable informed trading. The case for additional regulation is not supported.

This research provides evidence on the role of analyst briefings in Australia, using the rich and highly granular data available on Australian Securities Exchange (ASX) trading activity. We provide empirical evidence to inform policy makers currently considering changes to the continuous disclosure (CD) policy in Australia.

CD policy was introduced in Australia on 5 September 1994 to support ASX listing rule 3.1. CD requires that corporations continuously disclose ensuring that ‘the market is fully informed at all times so investors can make informed investment decisions’. In November 1999, ASIC issued Consultation Paper 5: Heard it on the grapevine, which served as a set of guidelines for company disclosure in Australia. Soon after this, ASIC provided the first evidence that the regulator and the courts would begin to enforce the full range of penalties and remedies (Coffey 2007). More recently, in November 2008, Senator Nick Sherry, then Minister for Superannuation and Corporate Law, issued a press release announcing a review by the Corporations and Markets Advisory Committee (CAMAC) into a range of market practices relevant to the integrity and transparency of the Australian share market. Senator Sherry requested that CAMAC:

- examine the role that analysts’ briefings play in Australia’s financial market, including whether their role is a positive one that leads to greater market efficiency; and
- advise whether changes may be required to Australia’s regulatory framework; and, if so, what form they should take.

The advisory committee’s position following the release of this report in June 2009 (CAMAC 2009) was that it did not see a need for further legislative intervention, although this conclusion was not supported by rigorous empirical evidence.

It is well accepted that changes to financial market regulation can impose costs on affected firms and can sometimes involve unintended consequences. Accordingly, systematic study of the costs and benefits of regulation is advocated as a precursor to regulatory change. The research conducted for this paper aims to provide empirical evidence on the role of analyst briefings in the Australian CD regime to verify CAMAC’s finding.

If there were valuable private information released at analyst briefings we would expect to see:

- price responses at the briefing date;
Average price responses at the announcement date (due
to prior incorporation of the ‘news’ through analyst
trading;
greater trading volume after the briefing date (although
prices could adjust without significant trading
occurring); and
evidence suggestive of active traders (informed
analysts) making profitable trades.

Sample and data selection
First, we identified the population of disclosed analyst
briefings between 1990 and 2008 via an electronic
keyword search of ASX company announcements. This
search was conducted by Sirca Limited, which also
provided all other data for this research. This period was
chosen to allow an investigation of almost five years
prior to the introduction of CD (on 5 September 1994),
as well as periods before and after the ASIC draft policy
document on analyst briefings (issued November 1999).
The process required identifying half-year and preliminary
full-year earnings announcements made on ASX. These
dates (and companies) were used as anchor points for
subsequent multiple keyword searches to identify open or
closed analyst briefings prior to the release of the results.
A very small number of observations (less than 10) were
returned prior to the release of the ASIC paper in 1999. As
a result of the lack of observations, the intended before
and after CD analysis was not achievable.

Using this initial sample, the announcements were
then read and categorised as either open, closed or
unidentified. An open briefing is one that is open to the
public, whereas a closed briefing is made to a selected
group of analysts. Some briefings have audiences that do
not fully satisfy being fully open or fully closed, and these
are classified as unidentified.4 The final sample consisted
of 73 open, 61 closed and 84 unidentified observations.
While results were produced for all three samples, as
well as for a combined group of all observations, in the
sections that follow we provide a detailed discussion of
the open and closed groups.

Empirical methods
In order to examine the impact of open and closed analyst
briefings on market microstructure characteristics, this
study investigates a range of metrics including returns,
volatility, volumes and a unique measure for informed
trading. Our focus is on whether these data indicate any
release of valuable information at the briefing date and
the public announcement date when there has been a
prior briefing.

One difficulty in event studies such as this is identifying
the counterfactual (or benchmark) — of no information
release in this case — against which to compare the data.
We use as the benchmark the corresponding data for
the firm concerned from a 10-week average finishing two
weeks prior to the event, and we examine differences from
that average to identify abnormal events.

Event windows
Each event window is an 11-day period, comprising trading
days only. This study analyses two windows, based
around two event dates (T=0). The first is the date of
the analyst briefing, the second is the periodic earnings
announcement. On average, the time period between the
analyst briefing date and the earnings announcement date
is 49, 50 and 51 days for the open, closed and unidentified
samples, respectively. Each window contains five trading
days before the event date and five trading days after the
event date (T-5, 0, T+5). As the study uses intraday
information, intervals of one hour are adopted to create
six intervals in each trading day and a total of 66 intervals
in each event window. Each of the metrics is calculated
using a sample that includes both on- and off-market
trades, with the exception of the informed trading metric
(because this requires details of the trade initiator which
are not available with off-market trades).

For each event window, we compare event intervals with
a benchmark control period, using the firm as its own
control. The control period is a 10-week period from -12 to
-2 weeks prior to the event period interval. All of the 66
hourly intervals in the event period have a control period
which relates to the same one-hour period on the same
day of the week. This approach allows us to control for
both day-of-the-week and time-of-day characteristics.

Return metrics
The volume-weighted average price (VWAP) is calculated for
each of the 66 hourly intervals of the event period. VWAPs
are also calculated over 10 corresponding periods in the
control period. The return for each period is then calculated
as \( \log \frac{\text{VWAP}(n)}{\text{VWAP}(n-1)} \). The abnormal return for
each period is calculated by subtracting the control period
average return for the corresponding interval.

Volume and volatility metrics
The volume metrics adopted are the total volume of
trading in shares, the total dollar value of the shares
traded, the total number of trades and the average
trade size. The volatility metric used is the interval range
VWAP, which is the maximum price in an interval less
the minimum price in that interval, scaled by the VWAP
of that interval. Abnormal measures are calculated by
subtracting the control from the event window interval.

Informed trading measure
This measure, which has not been used in prior research,
uses the highly granular data from ASX that allow trades
to be identified as either buyer or seller initiated. It
compares the trade initiation price with a scaled reference
price (which adjusts for changes in the market index) at
the end of a holding period (defined later) to determine
whether the trade made a profit or a loss. The calculation
is as follows:

\[
\text{Informed Trading} = \sum_{i=1}^{n} \frac{(BP_i + SP_i)}{(BP_i + SP_i + BL_i + SL_i)}
\]
where:

\(BP_i\) = value of buyer-initiated trades that made a profit;
\(SP_i\) = value of seller-initiated trades that made a profit;
\(BL_i\) = value of buyer-initiated trades that made a loss; and
\(SL_i\) = value of seller-initiated trades that made a loss.

Effectively, the formula uses the trade initiator profit to total trade ratio as a proxy for informed trading, based on the assumption that informed traders are likely to gain from having additional information.

To control for general market movements, the reference price (that is, the price on the last day of the assumed holding period that is used to determine if the trade resulted in a profit or a loss) is corrected for changes in the market index using the Australian All Ordinaries Index.

**Empirical results**
Due to space restrictions, we report detailed results for the set of open and closed briefings only, and all results are reported graphically.

**Abnormal returns**
The VWAP return calculations around the analyst briefing event date for the sample of closed briefings provide no real evidence of abnormal returns, with the cumulative abnormal returns (CARs) fluctuating in sign over time and generally being insignificant. For open briefings there is also little evidence to suggest that the CARs are significantly different from zero. Due to space restrictions, these results are not reported graphically.

Examining the second event window centered on the earnings announcement, the CARs are shown in Figures 1 and 2, where the bars represent \(t\)-statistics (measured against the right-hand axis) and where values around two or above indicate that the CAR is statistically significantly different from zero (at a 5 per cent level). The patterns in Figures 1 and 2 are markedly different, although there are few statistically significant individual CARs. The generally positive CARs for the closed sample, in contrast with the generally negative CARs for the open sample, suggests that valuable information is released in the earnings announcement subsequent to a closed briefing.

In summary, an analysis of the CARs for each of the windows fails to provide conclusive results. One explanation for the insignificant abnormal returns may be the lack of partitioning between positive and negative earnings announcements. Despite this, the results are consistent with the findings of Fleming (2001), which suggested that abnormal share prices (returns) were not significantly different from zero on the day of an open briefing.\(^5\) Our results indicate that valuable information is revealed when earnings are announced subsequent to a closed briefing (Figure 1), whereas no such carryover exists in relation to open briefings (Figure 2). Accordingly, there may be opportunities for informed trading, an issue we take up with the informed trading metric employed in this study.

**Abnormal volumes**
Abnormal total volumes for the closed and open sample at the analyst briefing date for the sample of closed briefings are contained in Figures 3 and 4, respectively. The findings suggest a clear spike in volumes on the event day for open and closed samples. In both cases there are several intervals that display abnormal volumes that are significant at the 5 per cent level. These findings suggest price sensitive information is being released to the market in both open and closed analyst briefings conducted prior to earnings announcements.

**FIGURE 1: Closed sample, earnings announcement window**

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\[^5\] Fleming (2001)
Similarly, the results suggest a change in trading activity on the day of the earnings announcement for both open and closed samples, particularly in the first hour of trading on the event day (interval 0). As can be observed from Figure 5 for the closed sample, there is a spike in volume that is significant at the 5 per cent level during four of the six-hourly intervals on both the earnings announcement day and the subsequent day. With respect to the open briefings sample (Figure 6), there are significantly increased volumes throughout the event day (interval 0 to +5), as well as significant volumes in four of the six-hourly periods on the day after the event (intervals +7, +8, +10 and +11).

Combined, the abnormal volume statistics are indicative of information being released to the market on each of the event days. One can conclude from this that there may have been price sensitive information disclosed in open and closed briefings prior to the earnings announcement, as well as in the earnings announcement itself.

**Abnormal volatility**
The results for abnormal VWAP volatility for the analyst briefing window for the closed sample show that there is a significant increase in abnormal volatility in the first hour of trading of the event day (interval 0). Both closed and open briefings result in significant abnormal volatility on the day of the event, but that volatility continues to be abnormally elevated on the day after the briefing for the open group. The results for the closed sample correspond with earlier findings of abnormal volume on the event day. Similarly, the open briefing sample has elevated volumes on the event day and the subsequent day (see Figure 4), and these periods also have increased volatility.

The earnings announcement windows also indicate that there is evidence of abnormal volatility on the event day, in both open and closed briefing samples (see Figures 7 and 8). This result is expected, given that we have previously shown abnormal volumes on the earnings announcement.

**Informed trading**
The results thus far fail to address the government’s concerns that closed analyst briefings may be creating

*These findings suggest price sensitive information is being released to the market in both open and closed analyst briefings conducted prior to earnings announcements.*
opportunities for insider trading. Turning the focus to informed trading, this section examines whether the abnormal trading activity is related to abnormal profits for trade initiators. The test of significance used in this section determines whether the informed trading measure is significantly different from 0.5; this value represents the point at which half of the investors initiating trades are making abnormal profits, given an assumed expiry (exit date) for the strategy, specified as the reference price. At this reference price point, it is expected that a reversing trade will take place to close out the position.

We calculate the informed trading metric for each of the 66 hourly intervals in the relevant window.

Figure 9 displays the results for two reference prices; namely, the price at the end of trading on the earnings announcement date (Inf Trading, Day 0) and the price at the end of trading 20 days after the earnings announcement (Inf Trading, Day 20). Beginning with the analysts’ briefing window for the closed group, the results in the top panel of Figure 9 suggest that there is no instance where trade initiators generate abnormal profits from the closed briefing sample using the last trade on earnings announcement day as the reference price. In fact, the reverse seems to be the case because there are 21 instances between 0 and +35 where the hourly informed trading metric is significantly negative. However, as the reference price is changed to the one prevailing 20 days after the earnings announcement to allow for (any) post-earnings announcement drift, the results are less striking, as shown in the lower panel. There is no systematic evidence of profits to informed trading. If accurate information pertaining to the subsequent earnings announcement is obtained by analysts in a closed analyst briefing, and if analysts trade on that information, one would expect that abnormal profits would increase relative to abnormal losses. However, the results do not support this expectation. This finding, that
Informed traders are either unable or elect not to profit from any information advantage obtained in a closed briefing, should alleviate concerns that such briefings create opportunities for insider trading.

In general, the open briefing sample provides similar results (the data are not included here for space reasons) to the informed trading measure (for exit at the announcement date), with 15 instances where this measure is significantly negative in the 35 hours after the briefing date. However, with the extended holding period (up to 20 days after the announcement date), there are two instances where informed trading is significantly positive (and four where it is significantly negative).

Overall, as with the closed sample, there is little evidence to suggest that informed trading increases as a result of open analyst briefings.

Our analysis of informed trading around the earnings announcement date again uses two reference prices, one being the last trade price 10 days after the announcement (Inf Trading, Day 10) and the other being the last trade price 20 days after the announcement (Inf Trading, Day 20). In Figure 10, the results from the closed sample are inconsistent with the presence of informed trading, with the abnormal trading figure oscillating around the expected 0.5 level (both panels of Figure 10) and there is no clear trend of informed trading before or after the
event day. Again, we conclude that there is no evidence suggesting that abnormal profits are being produced by trade initiators over this period.

The open briefing sample produces some evidence of informed trading, but this is confined to the period prior to the release of the earnings announcement (Figure 11). As indicated in Figure 11, there are some instances in panel A (two cases) and panel B (three cases) where the informed trading measure is significantly positive in the pre-announcement window. In summary, while there is some evidence that informed trading takes place prior to an earnings announcement that follows an open briefing, there is no similar evidence for closed briefings. This suggests that closed briefings are a mechanism by which markets are informed of upcoming earnings announcements, but that this is achieved
Conclusions

The purpose of this paper is to verify the findings of CAMAC's *Aspects of market integrity* report and to provide empirical evidence that will assist in CD policy deliberations. Using abnormal trading as a proxy for information disclosure, and a unique measure of informed trading, we document a number of interesting empirical findings. First, our results indicate that open and closed analyst briefings held prior to an earnings announcement result in the disclosure of new information. Further, the results show that in the case of closed briefings, the information disclosed is pertinent to the subsequent earnings announcement, a finding not present for open briefings. Second, despite this relationship, there is no evidence of abnormal profits being realised by informed traders following closed briefings. Thus there appear to be no substantial information asymmetries between informed and uninformed traders.

Overall, our results suggest that the analyst briefing process used by Australian companies adds to the timely provision of information to the market. Our paper also supports CAMAC's comments that the practice by which listed companies provide closed or private briefings from time to time to analysts, institutional investors and others, provides 'a useful and probably necessary supplement to their formal disclosures'.

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Notes
1. The authors acknowledge the helpful advice and suggestions of an anonymous referee and the Managing Editor, Kevin Davis.
2. See, for example, the report of the Regulation Taskforce, Banks (2006).
3. For a detailed coverage of related Australian and US research literature see Corones (2009).
4. Details of the classification systems adopted are contained in Corones (2009).
5. We also use OLS regression to explore whether there is a significant relationship between abnormal returns on the day of briefings and abnormal returns on the day of the subsequent earnings announcement. We use the briefing day abnormal returns as the dependent variable and the earnings announcement day abnormal returns as the explanatory variable. We add up the six-hourly intervals for each day to obtain daily returns. The regression is carried out for both open and closed briefings. The results show that the coefficient for the closed briefing sample earnings announcement is 0.1582, which is significant at the 5 per cent level. We interpret this result to indicate that only part of the subsequently released earnings news is priced on the day of the closed briefing, perhaps suggesting that there are opportunities for the analysts at these closed briefings to gain from an information advantage. For the open briefings, a coefficient of 0.1784 is estimated, however, this is not significantly different from zero due to the larger standard error of that sample. For open briefings it seems that knowing the abnormal returns on the day of the briefing does not help, in a statistically significant sense, to predict the earnings announcement day returns.
6. Our data do not allow us to identify the exact hour in which a briefing occurs.
7. Graphs are omitted for space reasons, but are available on request.

References
Australian Securities and Investments Commission (ASIC) 1999, Consultation Paper 5, Heard it on the grapevine, November.

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THE IMPACT OF RESIDENTIAL PROPERTY INVESTMENT on portfolio performance

To identify the potential diversification benefits of residential property, we extend a portfolio of traditional asset classes to include investment in residential property. We analyse the long-term price performances of domestic and international equities, government fixed income securities, listed property and Australian residential property, and construct return-maximising portfolios for given risk levels. Our results indicate that for every level of risk, a portfolio which includes residential real estate has a higher expected return than a portfolio without it. Given these findings, particularly the relative stability of returns on residential real estate and its demonstrated low correlation with other assets — especially equities — the current lack of investment vehicles in the residential real estate asset class is surprising.  

The unprecedented market volatility over the past five years has brought renewed focus to the risk-return profile of competing investment options and portfolio diversification. Residential real estate is one of the largest asset classes in the world, potentially offering significant diversification benefits in a multi-asset portfolio. Due to the global lack of accessible residential real estate investment vehicles, little research has considered the effect of an investment in this asset class on portfolio dynamics. This paper examines the effect on institutional multi-asset class portfolios of the inclusion of residential real estate. Specifically, it quantifies the additional diversification benefit of residential real estate investment at different investor risk profiles.

Residential real estate has many qualities — such as low correlation with equity and debt securities, and effective hedging against inflation — which should make it attractive to portfolio managers. However, direct investment in real estate involves taking a long capital position in the physical housing asset. While this is the most common method by which households invest in residential real estate, direct investment is typically illiquid and can be difficult to divest, involving high transaction and maintenance costs. It can also require taking a substantial exposure to the residential real estate asset class in order to achieve diversification effects. Portfolio managers are more likely to access residential real estate through securitised investment, available through real estate investment trusts (REITs) and mortgage-backed securities. While offering a less costly and more liquid method of accessing the broad real estate asset class, REITs in Australia are almost exclusively invested in retail, commercial, office and industrial real estate. Research has shown that the investment characteristics of residential real estate may be markedly different from other sub-categories of real estate (Webb et al. 1988; Lee 2008). Investment in REITs is conducted through organised exchanges, such as the Australian Securities Exchange (ASX). Oikarinen et al. (2009) show that REITs in the United States behave more like the broader equity market than other real estate assets.

Figure 1 charts the relative performance of residential real estate markets in several countries including Australia. Residential real estate prices in Australia and Canada, and to a lesser extent France and New Zealand, have risen relatively consistently over the past 15 years. In the decade to 2006, residential property prices in all countries grew strongly, nearly trebling in the United States and United Kingdom. These property markets were the hardest hit post-2006 through the global financial crisis (GFC).
One of the earliest examinations of residential real estate in a comparison with other investment classes was undertaken by Ibbotson and Siegel (1984). For the period 1947 to 1982, the authors observe a negative correlation between the returns on a capitalisation-weighted composite index of US residential, agricultural and commercial real estate, and the returns to the S&P 500 Index. They also observe a negative correlation between the returns to real estate and the returns to both long-term corporate and government bonds. Using the disaggregated agricultural, residential and commercial real estate indices from Ibbotson and Siegel’s study, Webb et al. (1988) show that in portfolios constructed using the different asset classes, residential real estate is given a significant positive weight in the mean-variance optimal portfolio.

Interestingly, the results from Webb et al. (1988) also show a very low level of correlation between returns to residential and non-residential property. Similar results are reported in Goetzmann and Ibbotson (1990) who use individual US city house price indices, and Hutchison (1994) who examines the UK residential real estate market. Lee (2008) examines inter-asset correlation using Australian residential real estate data. Through correlation analysis using data for the period 1996 to 2007, Lee (2008) identifies the diversification potential of Australian residential real estate with equities, bonds and commercial property.

Until recently, methods for taking advantage of the diversification benefits offered by residential real estate have been limited to direct and securitised investments, neither of which is readily representative of the aggregate market. Housing derivatives may be one solution to this, with the launch in May 2006 of US housing derivatives written over the S&P/Case-Shiller Index and the ASX’s March 2012 release of daily house price indices which are designed for trading.

### Asset classes
The asset classes modelled and used in the portfolio construction section of this paper cover equities (domestic and international), domestic government debt, listed property and residential property. The assets and their proxies are summarised in Table 1.
These indices are compiled on a quarterly basis covering the period January 1988 to December 2011. Note that this study uses total returns data. That is, the index proxies for domestic and international equities, government bonds and listed property represent capital gains and income to the investment. We assume a constant 2 per cent net yield (representing net rental income or housing services consumption) in addition to capital gains on residential property for consistency. This value is in line with conservative long-run estimates from real estate data provider RP Data. The international equities data is not adjusted for currency.

Figure 2 indicates the relative performance of these asset-classes for the sample period and highlights three key trends:

- Domestic equities, residential real estate and government bonds were the strongest performers over the total sample period, with relatively consistent positive growth;
- The strongest periods for positive growth across all assets were 1990 to 1999 and 2003 to 2007; and
- Domestic and international equities and, more recently, listed property, appear to move together more than government bonds and residential property.

Table 2 reports the return, volatility and inter-asset correlations of the asset-classes considered in this study. Domestic equities have the highest average annual return (9.95 per cent) of the asset classes considered, followed by government bonds (9.09 per cent), residential property (8.93 per cent), listed property (8.28 per cent) and international equities (7.77 per cent).

The GFC had a significant impact on the returns estimates for equities and listed property. Once we exclude the period since September 2007 (Panel B), the average returns to these assets increase by around 3 per cent and the volatility decreases.

Residential property and government bonds have the lowest volatility estimates (4.71 per cent and 5.69 per cent, respectively), while domestic equities (14.15 per cent), international equities (16.72 per cent) and listed property (14.92 per cent) have the highest volatility estimates. International equities continue to underperform on a risk-adjusted basis even once the GFC period is removed from estimates (Panel B).

In portfolio construction it is necessary to take inter-asset correlation into account. The principles of diversification mean that more efficient portfolios may be created as an investment is spread across more assets. That is, it is possible to create a portfolio with a higher expected return for a given level of risk than would otherwise be possible. These diversification gains are greater the lower is the inter-asset correlation.

Domestic and international equities have the highest correlation (0.76) over the total sample period. This likely reflects the increased globalisation of markets and capital flows, and the importance of international macro-economic events in market movements. The A-REIT market is also highly correlated with domestic equities.
(0.61) supporting the observations of earlier research (Oikarinen et al. 2009). Consistent with the findings of Ibbotson and Siegel (1984) and Lee (2008) among others, residential real estate is found to have a low or negative correlation with all other asset classes. It is worth noting that we observe domestic government bonds to have a low-to-negative correlation with all other asset classes considered in our sample period. Davis (2005) shows that this relationship was positive prior to 2000, and negative thereafter. The negative correlation between equities and government bonds is particularly strong through the GFC (2007–08) and, more recently, the European financial crisis (2009–12), during which monetary policy settings supported returns to bonds and funds were moved into safer assets (such as Australian government bonds) from riskier equity and listed property investments.

More than 50 per cent of value was wiped off equity and listed property markets through the GFC. Assuming that an event as extreme as the GFC occurs less than once in every 24 years (the length of our sample period), including it in the calculations may adversely bias the long-run estimates of risk and return. Removing all observations after September 2007 improves the observed average risk-adjusted annual return for all asset-classes. As presented in Panel B of Table 2, listed property has the highest average return (13.22 per cent) of all asset-classes in this truncated sample period, yet lower volatility (8.54 per cent) than domestic or international equities, which returned on average 13.09 per cent and 10.07 per cent, respectively. The pattern of inter-asset correlation is relatively consistent with the results when the GFC period is included. Residential real estate is remarkably resilient through the GFC, with little change to either the risk or return estimate.5

Optimal portfolios with residential real estate
Optimal portfolios are defined as those with the greatest possible level of expected return for a given amount of

<table>
<thead>
<tr>
<th>TABLE 2: Asset-class risk and return</th>
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<tbody>
<tr>
<td><strong>Panel A: January 1988 to December 2011</strong></td>
</tr>
<tr>
<td><strong>Domestic Equities</strong></td>
</tr>
<tr>
<td>Return (% p.a.)</td>
</tr>
<tr>
<td>Volatility (% p.a.)</td>
</tr>
<tr>
<td><strong>Correlations</strong></td>
</tr>
<tr>
<td>International equities</td>
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<tr>
<td>Government bonds</td>
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<tr>
<td>Listed property</td>
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<tr>
<td>Residential property</td>
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<tr>
<td><strong>Panel B: January 1988 to September 2007</strong></td>
</tr>
<tr>
<td><strong>Domestic Equities</strong></td>
</tr>
<tr>
<td>Volatility (% p.a.)</td>
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<tr>
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<tr>
<td>Residential property</td>
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</table>

In Figure 3, the addition of residential real estate to optimal portfolio analysis (the dashed line) results in a shift of the efficient frontier to the left. This means that for every level of risk, measured by volatility (the horizontal axis), a portfolio which includes residential real estate has a higher expected return (the vertical axis) than a portfolio without it.
volatility or, correspondingly, the smallest amount of volatility for a given expected return. A minimum variance frontier is derived by plotting the expected return of the optimal portfolio at each volatility level. The minimum variance frontier is constructed numerically following the process outlined by Markowitz (1952).6

Figure 3 shows the minimum variance frontier for multi-asset portfolios with and without residential real estate. The addition of residential real estate to optimal portfolio analysis (the dashed line) results in a shift of the efficient frontier to the left. This means that for every level of risk, measured by volatility (the horizontal axis), a portfolio which includes residential real estate has a higher expected return (the vertical axis) than a portfolio without it. We follow the approach of Costello et al. (2008) to test the significance of adding residential real estate to the portfolio results in a significant reduction in volatility at the 95 per cent confidence level, with our test returning a p-value of 0.02362 for the test statistic.

For further analysis, we select portfolios from this efficient frontier which match three commonly used investment strategies: conservative, balanced and growth. Investment strategies are typically matched to investor profiles, which provide a useful tool for advising on portfolio allocation, as each investor will have unique goals. We define our investor profiles by their risk tolerance.

A more conservative investor will accept a lower expected return on their portfolio if it means they can earn a more secure, less volatile, return. On the other hand, a growth-seeking investor with a much higher risk tolerance and longer-term investment objective may be prepared to invest in a portfolio with more volatility in exchange for a higher expected return. The balanced investor profile sits between the conservative and growth profiles.

Table 3 presents the expected return and volatility of a conservative, balanced and growth portfolio. We follow

<table>
<thead>
<tr>
<th>Panel A: Portfolio without Residential Real Estate Investment</th>
<th>Conservative</th>
<th>Balanced</th>
<th>Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expected Return (% p.a.)</td>
<td>9.5</td>
<td>11.0</td>
<td>13.0</td>
</tr>
<tr>
<td>Volatility (% p.a.)</td>
<td>5.10</td>
<td>9.25</td>
<td>16.93</td>
</tr>
<tr>
<td>Likelihood of Loss (% p.a.)</td>
<td>3.12</td>
<td>11.72</td>
<td>22.13</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Panel B: Portfolio with Residential Real Estate Investment</th>
<th>Conservative</th>
<th>Balanced</th>
<th>Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expected Return (% p.a.)</td>
<td>9.5</td>
<td>11.0</td>
<td>13.0</td>
</tr>
<tr>
<td>Volatility (% p.a.)</td>
<td>3.44</td>
<td>8.49</td>
<td>16.55</td>
</tr>
<tr>
<td>Likelihood of Loss (% p.a.)</td>
<td>0.29</td>
<td>9.75</td>
<td>21.61</td>
</tr>
</tbody>
</table>
ASIC’s MoneySmart guide to these investment strategies: a portfolio with around 70 per cent invested in fixed interest is viewed as conservative, a portfolio with around 70 per cent in listed securities is balanced, and a portfolio with around 85 per cent in listed securities is growth. That is, we identify the expected return and volatility of these portfolios excluding residential real estate, and then compare the change in volatility from the inclusion of residential real estate, holding expected returns constant.

For all portfolios, including residential real estate reduces volatility. This is most pronounced in the conservative portfolio where, for an expected return of 9.5 per cent, a portfolio with residential real estate has significantly less volatility (3.44 per cent) than a portfolio without it (5.10 per cent).

Table 3 also shows the likelihood of loss in any given year for these portfolios. For example, a conservative portfolio without residential real estate has a 3.12 per cent probability of loss in a year. This falls to 0.29 per cent with residential real estate investment. Without residential real estate, the probability of a negative return to each portfolio in any given year is higher. These results further demonstrate the benefit of residential real estate to portfolio diversification, particularly for a conservative strategy.

Figure 4 compares the absolute exposures to the different asset classes for the three optimal portfolios at different risk profiles that include residential real estate investment.

In the conservative profile portfolio, government bonds (30 per cent) and residential real estate (35 per cent) account for the largest absolute exposures. This is expected as these asset classes have the lowest return volatility. This profile has the greatest diversification benefit from the inclusion of residential real estate. The exposure to residential real estate falls to 17 per cent in the balanced portfolio and 10 per cent in the growth portfolio. The exposure to listed property and equities increases correspondingly in the higher-risk portfolios, albeit from a now relatively low base. Domestic and international equities account for 27 per cent of investment in the conservative portfolio rising to 64 per cent in the growth portfolio.

Residential real estate offers significant diversification benefits even after data from the recent GFC period is removed from estimates of expected return, volatility and correlation, making equities and listed property relatively more attractive. For all levels of volatility, the inclusion of residential real estate may create a portfolio with a higher expected return.

Table 4 reports the optimal portfolio expected risk–return dynamics at the three investor profiles excluding the GFC period from September 2007. Again, the greatest diversification gain is at the conservative investor profile. Without residential real estate, a portfolio with an expected return of 9.5 per cent has a volatility of 5.0 per cent. With residential real estate investment, the volatility of this conservative portfolio is 3.02 per cent.

The diversification gains to the balanced and growth portfolios are now reasonably large. A portfolio with a target expected return of 13 per cent has significantly lower volatility, when residential real estate is included (7.68 per cent), than a multi-asset portfolio restricted to equities, bonds and commercial real estate investment (6.68 per cent).

Given the low-to-negative correlation of its historical returns with the other asset classes considered in this analysis, these results support our expectation that the addition of residential real estate to a multi-asset portfolio would increase efficiency. That is, the inclusion of residential real estate enables the construction of...
portfolios with lower volatility for a given expected return (or, conversely, portfolios with a higher expected return for a given level of volatility).

Conclusion
The results demonstrate that including residential real estate in a well-diversified portfolio generates significant diversification benefits. Compared with a portfolio limited to domestic and international equities, government bonds, and listed property, a portfolio with residential real estate offers a higher rate of return for any given level of risk. The greatest diversification gains are at the conservative end of the scale.

This finding holds when the analysis excludes the GFC and the subsequent market correction. Removing observations through this unprecedented period of market volatility, the risk-return dynamics of equities and listed property are significantly improved. However, including Australian residential real estate in a well-diversified portfolio still offers large diversification benefits.

This analysis considers the total returns to each investment, requiring assumptions to be made about the yield and costs of residential real estate investment. No currency adjustment is made to the international investment component. These extensions present an interesting path for future research. However, it is expected that the results of this analysis will hold given the low correlation of residential real estate returns to other asset classes and our conservative estimate for net rental yield.

An extra consideration may be the additional risk of holding an undiversified basket of housing. While this paper makes an argument for residential real estate as part of a diversified institutional portfolio, many Australian households already directly hold residential real estate which would need to be analysed separately. Future research may also consider how fund managers account for investor home ownership in determining optimal asset allocation.

Given the investment potential of residential real estate, particularly its relative stability and demonstrated low correlation with other assets, particularly equities, the current lack of diversified investment opportunities in the asset class is surprising.

Residential real estate offers significant diversification benefits even after data from the recent GFC period is removed from estimates of expected return, volatility and correlation, making equities and listed property relatively more attractive. For all levels of volatility, the inclusion of residential real estate may create a portfolio with a higher expected return.

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<table>
<thead>
<tr>
<th>TABLE 4: Multi-asset portfolio characteristics excluding GFC</th>
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<tbody>
<tr>
<td><strong>Panel A: Portfolio without Residential Real Estate Investment</strong></td>
</tr>
<tr>
<td>Expected Return (% p.a.)</td>
</tr>
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<td>Volatility (% p.a.)</td>
</tr>
<tr>
<td><strong>Panel B: Portfolio with Residential Real Estate Investment</strong></td>
</tr>
<tr>
<td>Expected Return (% p.a.)</td>
</tr>
<tr>
<td>Volatility (% p.a.)</td>
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</tbody>
</table>
Notes
1. The authors acknowledge the financial support of Genero Group and the Securities Institute Research Centre of Asia-Pacific (Sirca) in producing this research, as well as the recommendations from Kevin Davis and an anonymous referee.
3. For simplicity, we report the results from arithmetic average calculations. The results are consistent when geometric averages are used.
4. Note that we do not consider franking credits or other tax benefits from any particular investment in this study.
5. In this regard, Australian real estate has gone against the global trend. As Figure 1 shows, the US and UK residential real estate markets were significantly affected through the GFC.
6. Specifically, portfolios which minimise total portfolio variance are created for 5,000 equally spaced expected return levels using historical risk and return estimates for our chosen securities.
7. This analysis assumes a normal distribution of returns.

References
While it is generally accepted that equities achieve higher returns than fixed interest on average over the longer run, recent financial market volatility and poor equity performance have raised questions about the required holding period. Our study addresses this issue by examining US stocks and Treasury bills from 1963 to 2011. We find that a 15-year holding period is required to ensure a 95 per cent probability that stocks will outperform the risk-free rate of return. And, for large market capitalisation stock portfolios (favoured by pension funds) the investment horizon is even longer.

Corporate finance students at university learn two important lessons from the history of capital markets: ‘risky assets, on average, earn a risk premium’ and ‘the greater the potential reward, the greater the risk’ (Ross et al. 2011, p. 324 and p. 329). In the United States, large market capitalisation stocks, such as the S&P 500 index, earned an average return of 12.3 per cent per annum from 1926 to 2007 while small company stocks earned 17.1 per cent per annum, and US Treasury bills earned a paltry 3.8 per cent per annum over the same sample period (Ross et al. 2010, p. 382). For the period from 1979 to 2009, large market capitalisation stocks in Australia earned 14.8 per cent per annum and small market capitalisation stocks earned 18.48 per cent per annum, while 90-day bank bills earned 9.26 per cent per annum.1 These returns are calculated over long time horizons, usually more than 30 years.

Although stocks deliver higher returns than risk-free rates over the long term, many investors have shorter investment horizons over which stocks may not earn a higher return than the risk-free rate. It is therefore important to understand how the probability of stock returns beating the risk-free rate varies with the length of the holding period. This issue relating to holding period returns has been highlighted in the aftermath of the global financial crisis (GFC), during which the risk-free rate of return has outperformed many risky assets over various holding periods.

Previous studies have documented the effects of risk, return and their impact on an investor’s time horizon. Using US data, Choi and Mukherji (2010) show that the Sharpe ratio of an investment portfolio increases as the investment time horizon lengthens. McEnally (1985) finds that the standard deviation of annual stock returns decreases as the holding period increases. Alles and Athanassakos (2006) show that investing in higher-risk Canadian asset classes produces higher end-of-period terminal wealth values as the time horizon increases from one to 20 years. Based on data for US stocks from 1926 to 2007, Bennyhoff (2009) finds that average returns per annum increase with the length of the holding period (although there is a slight fall between holding periods of three and five years) and the standard deviation also declines. Kritzman and Rich (1998) also find that the standard deviation of annual stock returns declines as the length of the holding period increases.

Overall, this brief literature review suggests that returns increase while risk decreases as the investment time horizon lengthens. What is not quantified in the literature is the holding period required to be confident to ensure that stock returns can beat the risk-free rate of return. Our study answers this question by examining how the level of...
statistical confidence (i.e. returns on stocks versus the risk-free rate of return) changes with the duration of the holding period. This knowledge is particularly pertinent today given the heightened uncertainty following the GFC and outperformance of the risk-free rate over many risky asset classes in recent years. Of course, the extent to which historical data provides information about future outcomes is always open to debate.

In this article, we investigate returns over holding periods from one to 20 years by employing daily US data from 1963 to 2011. We employ daily returns rather than monthly or annual returns for a number of reasons. First, this significantly increases the number of (overlapping) holding periods that we can analyse. Second, the daily sampling frequency provides us with the granularity to measure holding period returns to the exact day. Daily sampling frequency has been shown to be important over the long term as previous studies by Estrada (2008, 2009), Taleb (2007) and McLean (2012) suggest that missing the 10 highest return days or avoiding the 10 lowest return days over the long term can significantly alter the long-term compounding effect of the equity risk premium. For instance, McLean (2012) shows that investors who exclude the best 10 return days in the S&P 500 can realise a variation in the end-of-period portfolio value by at least 41 per cent over a 50-year time horizon. To fully capture these effects on investment time horizons, daily returns are employed in this study.

US data is employed as historical daily observations are not available for Australia for this length of time. We compare the stock market portfolio return and risk-free asset return for holding periods of 1, 3, 5, 8, 10, 15 and 20 years. We estimate a 20–30 per cent probability that stock market portfolio returns underperform the risk-free rate of return (i.e. US government one-month Treasury bill) when the holding period is less than 10 years. However, when the holding period increases to 15 years, there is a 95 per cent statistical probability that the average stock market return beats the risk-free rate of return. For our sample period, holding the market portfolio for 20 years always beats the risk-free asset no matter what day in history you entered the market. We also find that the Sharpe ratio monotonically rises with an increase in the holding period, which suggests that investors gain a higher risk–return trade-off as the holding period lengthens. These findings are generally consistent with the prior research from Alles and Athanassakos (2006) and McEnally (1985).

We also examine how different holding periods have different implications for returns on portfolios of small, medium and large market capitalisation stocks. We report that the chances of underperforming T-bills for small-

Investors who own large market capitalisation portfolios must endure an investment time horizon of 19 years to be 95 per cent statistically confident of beating the risk-free rate of return. This finding has important implications for superannuation funds because realising the equity risk premium from US large market capitalisation portfolios requires the longest period of time in comparison with other US stock portfolios.

FIGURE 1: Time-series plot of stock market index and T-bill index

Note: This figure presents a total return index for both the US market portfolio return and the US government one-month T-bill return reconstructed with the index value commencing at 100 on 30 June 1963. The sample ends on 30 September 2011.
and medium-sized firm portfolios decreases rapidly as the holding period increases. However, investors who own large market capitalisation portfolios must endure an investment time horizon of 19 years to be 95 per cent statistically confident of beating the risk-free rate of return. This finding has important implications for superannuation funds because realising the equity risk premium from US large market capitalisation portfolios requires the longest period of time in comparison with other US stock portfolios. These long time horizons also provide new insights for individual investors about the risk reduction benefits of re-allocating long-term retirement savings from stocks to cash as they near retirement. The findings from this study suggest that the risk reduction benefits from the shift from stocks to T-bills may require a longer time horizon than previously anticipated.

Data and empirical results

For this study, we obtain daily arithmetic returns on US stock indices and US government one-month T-bills from 1 July 1963 to 30 September 2011 sourced from Professor Kenneth French’s Data Library, which we convert into compound daily returns for the 12,148 days in the sample period. The US stock data reflects total returns to the investor as they also include the reinvestment of dividends. Figure 1 shows the time series plot of the US market index and T-bill index constructed from this data. The US market index return in Figure 1 can be divided into two parts: the risk-free rate of return; and the additional return in owning the stock portfolio, which is the excess return.

We calculate the excess return per annum for rolling series of N year holding periods (where N = 1, ..., 20) as a compound annual rate of return. The first return is calculated from the first entry date (1 July 1963) until the end of the holding period, and the next return is calculated by rolling one day forward, and so on. For the one-year holding period we have 11,896 overlapping periods, for a two-year holding period we have 11,644 overlapping periods, and 11,392 for three years, and so on. These holding period returns are converted into compound annual rates of return based on the following:

\[
\text{N year \ CARR} = \left[ (1 + \text{HPR}_{mr,N})^{\frac{1}{N}} - 1 \right] - \left[ (1 + \text{HPR}_{rf,N})^{\frac{1}{N}} - 1 \right]
\]

where:

\[N = \text{number of years;}
\]

\[\text{CARR} = \text{compound annual rate of market return in excess of the risk-free rate;}
\]

\[\text{HPR}_{mr,N} = \text{holding period return of the market portfolio for } N \text{ year(s); and}
\]

\[\text{HPR}_{rf,N} = \text{holding period return of the risk-free rate of return for } N \text{ year(s).}
\]

We report the summary statistics in Table 1 and graphically illustrate them in Figure 2. We also report the summary statistics of the risk-free rate of return in Table 2. Figure 2 shows the histograms for 1, 5, 10 and 20-year holding periods for compound annual rates of excess returns. It clearly shows that owning stocks for longer holding periods reduces risk (i.e. the dispersion of CARR returns declines substantially) and stock returns are always higher than the risk-free T-bill returns for holding periods of 20 years for the period studied. Ultimately, our

![Figure 2: Dispersion of CARR of excess returns for different holding periods](image)

Note: This figure presents the distribution of average compound annual rate of excess returns over various holding periods. HPR=1, 5, 10 and 20 denotes the holding period of 1, 5, 10 and 20 years, respectively.
concern is with the probability of those excess returns being less than zero (i.e. the frequency of observations less than zero in the Figure 2 histograms). But, it is also instructive to examine the properties of those distributions which are presented in Table 1.

Table 1 presents the summary statistics of the compound annual rate of excess returns (i.e. the return greater than the risk-free rate of return) over various holding periods (N) in years. As the holding period lengthens, the mean and median excess returns rise to reflect their long-term historical excess return. The standard deviation of these CARRs in Table 1 declines steadily as the holding period increases, implying lower levels of risk with longer investment horizons. This is also reflected in the maximum and minimum values of the rolling excess returns, that is, the difference between the maximum and minimum returns shrinks considerably as the holding period increases.

Interestingly, in the period studied, when US stocks were held for 20 years, the excess return never fell below zero. Therefore, US stock returns always outperformed T-bills in a 20-year investment time horizon but this did not occur for shorter holding periods. Table 1 also reports a 31 per cent probability of stocks underperforming T-bill returns in a single-year holding period. The chance of stocks underperforming T-bills declines to 23.49 per cent over a 10-year holding period.

Table 2 presents the same summary statistics of the CARRs for the risk-free rate of return (US one-month Treasury bills). Table 2 reports an incremental increase in the average returns of the risk-free rate as the holding period increases. This rising return reflects the mean rate of return earned by holding US T-bills over the long term.

Figure 3 shows that the longer is the holding period, the lower is the percentage of negative excess returns (although it is not a smooth range of probabilities). It is important to acknowledge that the y-axis denoting probabilities in Figure 3 commences at 32 per cent for one year to 19 per cent for seven years and then subsequently rises to 25 per cent for 11 years. These variations or ‘kinks’ in the probability curve in Figure 3 are caused by periods of stock return underperformance or outperformance at the first entry date or at the end of each holding period, or a combination of both.

Figure 4 presents the average Sharpe ratio over \( N = 1, 2, \ldots, 20 \) annual holding periods. Clearly, the Sharpe ratio increases as \( N \) increases, implying a higher risk-adjusted performance for longer holding periods.

### Table 1: Summary statistics of the CARR of excess returns

<table>
<thead>
<tr>
<th>Holding Periods</th>
<th>1</th>
<th>3</th>
<th>5</th>
<th>8</th>
<th>10</th>
<th>15</th>
<th>20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean (×100)</td>
<td>5.83</td>
<td>4.38</td>
<td>4.31</td>
<td>4.44</td>
<td>4.45</td>
<td>5.26</td>
<td>5.49</td>
</tr>
<tr>
<td>Median (×100)</td>
<td>8.73</td>
<td>5.11</td>
<td>4.34</td>
<td>4.65</td>
<td>5.63</td>
<td>5.99</td>
<td>5.96</td>
</tr>
<tr>
<td>Standard Deviation (×100)</td>
<td>17.92</td>
<td>8.96</td>
<td>6.63</td>
<td>4.88</td>
<td>4.58</td>
<td>3.29</td>
<td>2.49</td>
</tr>
<tr>
<td>Minimum (×100)</td>
<td>-50.68</td>
<td>-20.98</td>
<td>-12.28</td>
<td>-7.34</td>
<td>-6.37</td>
<td>-2.30</td>
<td>0.63</td>
</tr>
<tr>
<td>Maximum (×100)</td>
<td>80.15</td>
<td>26.10</td>
<td>22.16</td>
<td>16.43</td>
<td>14.69</td>
<td>12.39</td>
<td>11.08</td>
</tr>
<tr>
<td>Percentage when excess return &lt; 0 (%)</td>
<td>30.64</td>
<td>27.28</td>
<td>27.93</td>
<td>20.42</td>
<td>23.49</td>
<td>4.84</td>
<td>0.00</td>
</tr>
</tbody>
</table>

**Note:** All of the numbers are expressed in percentage terms. The excess return is defined as the market return over and above the risk-free rate of return. The first return is calculated from the first entry date (1 July 1963) until the holding period expires, and the next return is calculated by rolling one day forward, and so on. The holding period return is then expressed as a compound annual rate of return (CARR). Finally, the summary statistics of these thousands of CARRs are presented in this table. ‘Percentage when excess return <0 (%)’ denotes the probability of negative excess returns per annum out of the total number of excess returns.

### Table 2: Summary statistics of the CARR of the risk-free rate

<table>
<thead>
<tr>
<th>Holding Periods</th>
<th>1</th>
<th>3</th>
<th>5</th>
<th>8</th>
<th>10</th>
<th>15</th>
<th>20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean (×100)</td>
<td>5.47</td>
<td>5.60</td>
<td>5.73</td>
<td>5.85</td>
<td>5.96</td>
<td>6.20</td>
<td>6.33</td>
</tr>
<tr>
<td>Median (×100)</td>
<td>5.20</td>
<td>5.25</td>
<td>5.37</td>
<td>5.49</td>
<td>5.62</td>
<td>6.22</td>
<td>7.11</td>
</tr>
<tr>
<td>Standard Deviation (×100)</td>
<td>2.93</td>
<td>2.60</td>
<td>2.34</td>
<td>2.15</td>
<td>2.01</td>
<td>1.69</td>
<td>1.38</td>
</tr>
<tr>
<td>Minimum (×100)</td>
<td>0.00</td>
<td>0.08</td>
<td>1.51</td>
<td>1.93</td>
<td>1.84</td>
<td>2.90</td>
<td>3.21</td>
</tr>
<tr>
<td>Maximum (×100)</td>
<td>15.29</td>
<td>12.65</td>
<td>11.34</td>
<td>10.06</td>
<td>9.19</td>
<td>8.32</td>
<td>7.72</td>
</tr>
</tbody>
</table>

**Note:** All of the numbers are expressed in percentage terms. The risk-free rate of return is defined as the return from US government one-month Treasury bills. The first return is calculated from the first entry date (1 July 1963) until the holding period expires, and the next return is calculated by rolling one day forward, and so on. The holding period return is then expressed as a compound annual rate of return (CARR). Finally, the summary statistics of these thousands of CARRs of the risk-free rate are presented in this table.
and examine the three types of quintile size portfolios. The small-sized firm stock portfolio consists of stocks from the smallest 20 per cent of US publicly listed firms. The medium-sized firm portfolio comprises the middle 20 per cent of stocks (i.e. medium-sized firm stocks). The large-sized firm portfolio consists of the top 20 per cent (i.e. the largest-sized firm stocks). The results for these size portfolios are illustrated in Figure 5. Similar to Figure 3, the findings in Figure 5 reveal a general pattern of decline in the percentage of negative excess returns for all three portfolios. Interestingly, while the percentage of negative returns for small- and medium-sized firm portfolios immediately declines as the holding period increases, the large-sized firm portfolio declines only when the holding period exceeds 12 years. Figure 5 also reveals that the US large market capitalisation portfolio requires a holding period of 19 years to exhibit a 95 per cent statistical probability of outperforming the risk-free rate.

These findings are consistent with related research by Mukherji (2008) which shows that US small company stocks are preferred to large company stocks when constructing mean-variance portfolios with higher target returns and longer investment horizons. This preference towards small company stock returns over the long-term can be explained by the Fama and French (1992, 1993) small firm (SMB) risk factor (or premium) that is well documented in the finance literature. Figure 5 represents the difference in performance between small cap returns (11.81 per cent p.a.) versus large cap returns (i.e. 10.11 per cent p.a.) within an investment time horizon context.

These results have significant implications for both institutional and individual investors. Australian superannuation funds who own US large market cap portfolios require a longer holding period to be confident of realising the equity risk premium in comparison with holding the overall US market portfolio, small-cap or mid-cap stock portfolios. For individual investors, the long investment time horizons estimated in this study suggest that, as we approach retirement, the asset allocation away from stocks and into cash may need to occur earlier than many finance professionals currently suggest.

We also test (using a nonparametric Wilcoxon rank-sum test) whether the median excess returns differ significantly for different holding periods (of 5, 8 and 10 years). We reject (at a 1 per cent significance level) the null hypothesis of no difference — which is consistent with the visual impression from Table 1 that median excess returns become larger as the holding period increases from five to 10 years.

Finally, we examine whether US stocks sorted by firm size provide us with new knowledge. We obtain the Fama and French (1992, 1993) market capitalisation size portfolio returns from the Kenneth French Data Library and

For individual investors, the long investment time horizons estimated in this study suggest that, as we approach retirement, the asset allocation away from stocks and into cash may need to occur earlier than many finance professionals currently suggest.
will outperform the risk-free rate of return. An analysis of firm-size portfolios reveals that the large market cap portfolio in this study requires a holding period of 19 years to exhibit the same statistical probability of beating T-bill returns. This finding has important implications for superannuation funds who favour US large market capitalisation portfolios as these results suggest that owners of large-cap portfolios require an exceedingly long investment horizon in order to beat the risk-free rate of return.

As mentioned in Blanchard (1993) and Fama and French (2002), the use of historical returns to estimate expected returns (in the future) is common practice among academics and industry professionals. This historical study provides a new perspective on the risks associated with realising the US equity risk premium over varying investment time horizons. Investigating the holding period effect on the equity risk premium in Australia and across international stock markets offers interesting directions for future research.

Notes
1. Short-term Treasury bills (or Treasury Notes) are usually considered as risk-free assets. However, as the Treasury Note in Australia was discontinued from July 2002 to February 2009, 90-day bank bills rates are used instead.
3. The number of overlapping periods declines as the length of the holding period increases because of the fixed number of daily observations.
4. As the data employed in this study consists of overlapping holding period returns, the data observations are not independent and identically distributed (IID) and, therefore, we employ the nonparametric Wilcoxon rank-sum test. Results are available on request.

References
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