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Funding retirement: Next generation design
ROBERT C. MERTON
Funding retirement is a growing challenge and it is a global one. Even in countries such as Australia, which embraced defined contribution plans two decades ago, there are questions about the adequacy of individual savings.

S&P/ASX 200: Does change in membership matter?
CAMILLE SCHMIDT, LUCY ZHAO and CHRIS TERRY
Studies over recent decades of the return effects for the stocks added to and deleted from the S&P 500 have documented the so-called ‘S&P game’, where traders could profit from stock price reactions to changes in the index's composition. Studies on the All Ordinaries Index covering the 1990s also found profitable trading opportunities over the pre-announcement period. Our study of the effects of changes in the composition of the S&P/ASX 200 from its introduction (in April 2000) to June 2009 found these pre-announcement opportunities were eliminated but that potential exists for the ‘S&P/ASX 200 game’ between announcement and implementation dates.

The role of equity analysts in the pricing of Australian CDS spreads during the financial crisis
ANDREW AINSWORTH and JIRI SVEC
Understanding the key drivers of risk premia in times of heightened risk enables credit traders to assess more accurately market-implied corporate credit risk. By analysing the determinants of Australian corporate credit default swap (CDS) spreads we examine whether equity analysts’ price forecasts played a role in the pricing of Australian CDS spreads during the financial crisis. Equity analysts’ one-year-ahead stock price targets provide a proxy of cash flow uncertainty that should be reflected in firms’ CDS spreads. We find that an increase in the dispersion of analysts’ forecasts increases CDS spreads and, during financial crisis, equity-based market variables are more relevant to the pricing of CDS spreads than commonly used leverage and credit ratings.

Do rational speculative bubbles exist in the Australian stock market?
GILBERT V. NARTEA and BERT D. WARD
Using McQueen and Thorley’s (1994) duration dependence technique, we examine whether the Australian share market was characterised by rational speculative bubbles over the period from 1985 to 2012. Our analysis of both monthly and weekly returns shows no evidence of rational speculative bubbles over the sample period. This suggests that the long run-up in stock prices and the subsequent drop in the mid-1980s and in the months prior to the global financial crisis of 2008 may have been due to either fundamental value changes or irrational investor behaviour.
Sustainable withdrawal rates during retirement and the risks of financial ruin
LAKSHMAN A. ALLES F Fin
The importance of sustainable spending rates by retirees has been underscored by rapid population ageing and the lacklustre performance of markets and pension funds in the post-GFC period. This suggests that financial planners and advisors should pay more attention to the estimation of risk in retirement finance modelling in their analyses and advice to clients. This paper provides some useful guidance on the application of two available techniques in this regard.

OTC derivatives in a post-GFC world: Australia’s commitment to the G20
DAVID ROBINSON SA Fin and JANE HRONSKY
With the over-the-counter (OTC) derivatives market being identified as a key contributor to risk in the global financial crisis (GFC), this paper explores the implications of the regulatory response for the Australian OTC derivatives market. It highlights that the benefits of the proposed new institutional framework need to be considered relative to their potential costs.

New Zealand insider trading regulation: A market assessment
BART FRIJNS SA Fin, AARON GILBERT and ALIREZA TOURANI-RAD F Fin
Many countries have taken what appears to be a tough stance on insider trading, treating it as a criminal offence. While this approach is often very popular with the general public, there is little evidence that these laws are effective. In this paper, we assess the market impact of two consecutive changes in insider trading regulation in New Zealand in the past decade, discussing the findings of two recent studies and the way forward.

Consumer protection in the financial sector: Recent regulatory developments
ROS GRADY
After examining the significant international and Australian developments in financial consumer protection, this paper indicates that new international principles and standards in this area lack cohesion and leave a number of important issues unanswered. It finds that there remains much work to be done.
In this final issue of JASSA for 2012 we are fortunate to be able to publish an edited version of the address which Nobel Laureate Professor Robert Merton gave at a recent Finsia conference addressing the topic of optimal design of superannuation. One of the contributed papers also considers superannuation while the other three contributed papers focus on the role of information and efficiency of financial markets.

Also included are three articles which are edited versions of papers presented at the 17th Melbourne Money and Finance Conference — Recent Developments in Financial Regulation: An Assessment — held in July 2012. The conference was organised by the Australian Centre for Financial Studies and kindly sponsored by APRA, the Reserve Bank and Finsia. While not subject to the usual double-blind review process, each of these papers has been reviewed by the Managing Editor and a member of the Editorial Board prior to inclusion.

Professor Robert Merton provides a blueprint for a new, fully integrated retirement system. He argues that the focus should be shifted from wealth available at retirement to the potential retirement income stream which will be available. The strategy of fund managers would be to ‘maximise the prospects of achieving a desired standard of living, subject to a risk constraint of a “minimum or essential life income” amount in retirement’. Those parameters can be determined with reference to individual circumstances and preferences, with individuals being made aware of contributions required, and advised regularly on risks of shortfall and adjustments required to contribution rates. Crucially, the complex asset allocation issues involved in achieving the objectives could be ‘kept under the hood’ — as something which fund managers need to attend to, but which are matters that members have little interest or expertise in.

In the first of the three papers addressing information and efficiency issues in financial markets, Camille Schmidt, Lucy Zhao and Chris Terry focus upon whether changes in the composition of the S&P/ASX 200 Index (over the period 2000 to 2009) have consequences for the returns on shares in companies which are included or excluded. Since this is purely a result of changes in relative market capitalisation of the companies involved, and conveys no new information about their past or future performance, there should be no effect. However, prior studies of index composition change have found evidence of abnormal returns around the event date. These effects are generally attributed to the need for index-tracking funds to rebalance their portfolio allocations (selling shares in those excluded and buying shares in those included) which could directly affect share prices and create trading opportunities for those anticipating such events. Schmidt et al. find no abnormal returns prior to the announcement date, but find that between the announcement date and implementation date, those stocks added had cumulative abnormal returns of 6 per cent which, consistent with cessation of rebalancing trading, were largely reversed over the next month.

Next, Andrew Ainsworth and Jiri Svec examine whether the level and dispersion of one-year-ahead stock price targets of equity analysts help explain the pricing of Australian credit default swap (CDS) spreads. Their results indicate that the level and dispersion of analysts’ price forecasts (relative to current stock price), which are interpreted as a proxy for firm cash flow uncertainty, increases CDS spreads. During the financial crisis, equity-based market variables are more relevant to the pricing of CDS spreads than commonly used leverage and credit ratings.

Using McQueen and Thorley’s (1994) duration dependence technique, Gilbert V. Nartea and Brett D. Ward examine whether the Australian share market was characterised by rational speculative bubbles over the period from 1985 to 2012. Although previous studies have reported evidence of bubbles in the Australian equity market during the 1987 crash, and anecdotal evidence seems to suggest a bubble episode during the period leading up to the global financial crisis (GFC) of 2009, they find at best marginal evidence of the presence of rational speculative bubbles in the Australian stock market over the period examined.

Returning to the topic of superannuation, Lakshman A. Alles Fin addresses the issue of sustainable (consumption) withdrawal rates from an initial retirement balance during retirement and the risks...
of financial ruin. He raises the important question of how retirees can determine the optimal amount to withdraw while maintaining some minimum safety level in their portfolio value if investment returns and remaining life span are uncertain. He notes that financial planners and advisors should pay more attention to the estimation of risk in retirement finance modelling in their analyses and in their advice to clients, and his paper provides some useful guidance on the application of simulation and analytical techniques in this regard.

In the first of the papers from the 17th Melbourne Money and Finance Conference, the paper by Ros Grady on consumer protection in the financial sector indicates that new international principles and standards in this area lack cohesion and leave a number of important issues unanswered. Grady indicates that although significant work has been undertaken to bolster the rules on consumer protection as they apply to financial products and services, there is still much more to be done to determine whether we are addressing the right issues and in the most effective way.

While the full extent and timing of the proposed changes in the regulation and structure of the Australian over-the-counter (OTC) derivatives market are still subject to further consultation, David Robinson SA Fin and Jane Hronsky explore the implications of these proposals. They suggest that the broad intentions of the proposed framework are beginning to emerge: to increase the transparency of OTC transactions and reduce counterparty credit risk, and thereby reduce systemic risk. They also indicate that the proposed benefits of this new institutional framework need to be considered relative to their potential costs.

Finally, Bart Frijns SA Fin, Aaron Gilbert and Alireza Tourani-Rad F Fin assess the market impact of two consecutive changes in insider trading regulation in New Zealand in the past decade, discussing the findings of two of their recent studies and the way forward. The authors suggest that while many countries have taken what appears to be a tough stance on insider trading, treating it as a criminal offence, and that this approach is often very popular with the general public, there is little evidence that these laws are effective.

We sincerely thank all of the authors who have submitted articles to JASSA this year and look forward to your comments and more outstanding contributions next year.

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FUNDING RETIREMENT:
next generation design

Due to excessive complexity in investment choices and a focus on the wrong goals, hundreds of millions of low- to middle-income earners face a precipitous decline in their living standards upon their departure from the workforce.

But it doesn’t have to be that way. Technology, innovation and our understanding of what are meaningful choices about retirement funding mean we are now in a position to design a better system that serves all people, not just the wealthiest ones.

My own extensive study in this area tells me that the goals of efficiency, rigour, strong governance, simplicity, engagement, customisation and adequacy of outcomes should not be incompatible or mutually exclusive in any retirement savings system.

The task of building a new-generation system starts with properly defining the goals. So in this paper I go back to first principles, put aside existing assumptions and ask ‘if you were designing a retirement savings system today, what would you do?’

A better design
The use of defined-contribution (DC) plans has become the default strategy in Australia since the introduction of compulsory superannuation two decades ago. In the United States and Europe, the embrace of DC has been more recent.

While defined-benefit (DB) plans provided a level of certainty for employees about income in retirement, they are unsustainable and unaffordable for their sponsors.

DC solves the problem for trustees by making costs predictable and by taking risk off the plan-sponsor’s balance sheet. But it burdens users with having to make complex decisions about issues in which they have zero expertise. For many, particularly those for whom retirement is a long way away, the temptation is to conclude that it’s all too hard.

So, in considering how to reshape this system, we should start by establishing the goal.

What are members seeking to achieve? Well, for most people, it’s fairly simple. They want an inflation-adjusted level of funding that allows them to sustain the standard of living in retirement that they have grown accustomed to in the final years of their working lives.

How do we define a standard of living in financial terms? The traditional assumption might be the nomination of a sufficiently large lump sum. Indeed, that is the premise of most DC plans, including most in the Australian superannuation system. The focus is on amassing a sufficiently large lump sum in the accumulation phase.

But in reality, when talking about a standard of living, people think of income. For example, the aged pension benefit is described in terms of an annual payment and not in terms of the present value of those payments. Similarly, a DB plan benefit is expressed as income per year for life and not by its lump-sum value. The same story holds for an insurance company life annuity.

While the mores of Regency era England are a world away from those of today, forgive me if I use an illustration from Jane Austen’s Pride and Prejudice. In this classic novel, Mr Darcy is judged an economically worthy catch not on account of his total accumulated wealth but because he is ‘worth £10,000 a year’. In other words, the standard of living he could provide is defined by his cash flow, not his cash pile.
These are not meaningful decisions for 99.99 per cent of the population. And it is no wonder that people do not feel engaged with the system as it stands. Asking individuals to make these sorts of decisions is like a surgeon asking a patient being wheeled into the operating room how many sutures he or she wants. It is a decision the patient is ill-qualified to make and it is not something that should concern them.

Essentially, this is why a defined-benefit type of payout is so attractive. We know the income we will receive, there are no complex decisions about asset allocation or investment strategy, and the risk is on someone else’s balance sheet. Unfortunately, DB plans are neither affordable nor sustainable. We have already decided that.

On the other hand, does it make sense to ask a 30-year-old to make decisions on an appropriate asset allocation today that will deliver them an adequate income 35 years from now? Does it make sense to ask individuals how much emerging-market exposure they want or what level of maturity risk they desire in their fixed-income allocation?

These are not meaningful decisions for 99.99 per cent of the population. And it is no wonder that people do not feel engaged with the system as it stands. Asking individuals to make these sorts of decisions is like a surgeon asking a patient being wheeled into the operating room how many sutures he or she wants. It is a decision the patient is ill-qualified to make and it is not something that should concern them.

As well as this unnecessary complexity, most DC plan allocations take no account of individual circumstances, including human capital, housing and retirement-dedicated assets held outside the DC plan. Those are all important inputs for an allocation decision customised to the needs of each person.

So if we are to design a next-generation retirement solution, there are a few requirements we need to meet:

- First, we need robust, scalable, low-cost investment strategies that make efficient use of all dedicated retirement assets to maximise the chance of achieving the retirement income goal and manage the risk of not achieving it.
- Second, we need a risk-managed customised solution with individually tailored goals for each member — taking into account his or her age, salary, gender, accumulation plan and other assets dedicated to retirement.

- Third, we need a solution that is effective even for individuals who never provide information or who never become involved in the decision-making process at all. And, for those who do become engaged, we need a solution that gives them meaningful information about how they are travelling and what they can do if they are not on track to achieve their retirement income goals.
- Last, we need a solution that allows plan sponsors (or pension fund trustees) to control their costs and eliminate balance sheet risk.

Traditionally, DB plans served some of these needs. But these plans were unsustainable, as their cost was greatly underestimated. In more recent years, those problems have become exacerbated by longer life spans, falling interest rates and increasing volatility in financial markets.

What I have in mind, then, is a DC plan that satisfies the goals of sponsors/trustees, while providing the attractive outcomes for members of DB plans, which do such a good job of meeting the needs of retirees.

Yes, users should be given choices. But those choices should be ones that are meaningful to them, not the choices that are typically given today, such as what mixture of equities and debt to include in a portfolio.

So, we have established our criteria for good design. We need simplicity, scalability, sustainability, customisation and integration in the service of delivering members an inflation-adjusted income for life and managing the risk of them not getting there.

Next-generation retirement planning
In order to receive an inflation-protected income for life upon retirement, individuals must expect to pay actual market prices. Thus, during the accumulation period of their lives, mark-to-market prices should be used. But where do we find such prices?

The answer is we can approximate them based on current market prices for inflation-protected bonds and annuities. What I suggest is that, rather than using arbitrary interest rates for the long run to estimate the price of the income stream at retirement, plan developers should use current market prices and mortality experience derived from actual annuity prices. They should mark to market the estimated price of the annuity stream with respect to interest rates and not to arbitrary or ‘hoped-for’ projections of those rates.

For example, if a plan is based on an assumed 4 per cent interest rate at retirement and the actual rate turns out to be 2 per cent, then retirees will not have the amount of money needed to produce the income they had counted on. Thus, estimated accumulation requirements for income goals must be based on actual interest rates. As well, the risks of interest
rate changes should be taken into account in the investment strategy during the accumulation period. That interest rate risk should be explicitly hedged using inflation-protected, long-duration bonds for the ‘safe’ component of the strategy.

In addition, plans need to be portable. They need to be protected against all credit risks, or at least against the credit risk of the employer. Plans also need a certain degree of robustness, and that robustness must be appropriate to the people who use them.

As an analogy, if I were designing a Formula 1 race car, I would assume that it would be driven by a trained and experienced Formula 1 driver. So, knowing that the car would not be misused in any way, I could build into its design a high degree of precision.

But if I were designing a family sedan, I would have to be more concerned about robustness. I would have to assume the owner would sometimes forget to change the oil or would occasionally bang the tyres into the kerb. Assuming the car would be misused to some degree, my design would have to be sufficiently solid to withstand less-than-optimal behaviour and yet still provide the intended outcomes.

In applying this analogy to financial plan design, one should probably not assume users will revise their savings rates in the optimal or recommended fashion.

**Qualities of plan design: simplicity and constancy**

The simplest retirement solution is one in which the members do absolutely nothing. They provide no information and make no decisions. In fact, they are not engaged in the process at all until they reach retirement.

While such extreme behaviour is rare, to be robust, a well-designed retirement solution must be effective to that standard. We know that member engagement during the accumulation period can be very infrequent and unreliable, especially among those more than a decade away from retirement. Of course, at some point, most members will become engaged and the design should ensure that this engagement actually enhances the chances of success in achieving the desired income goal.

But how is that achieved?

To use the car analogy again, if I were seeking to sell my design to a professional race team, I would have to include numbers on the vehicle’s compression ratio, total brake horse power, aerodynamics and other key technical indicators important to the operation of the car.

But for the average person, the key questions around a car purchase usually centre on things such as fuel efficiency, acceleration and safety features. To this person, those important technical numbers are not meaningful because they cannot interpret them in terms of what matters to them about the car’s performance.

Likewise, in the retirement system, we need to design products based on questions that are meaningful for people, such as:

- What standard of living do you desire in retirement?
- What standard of living are you willing to accept?
- What contribution or savings rate are you willing or able to make?

Such questions embed the trade-off between consumption during work life and consumption in retirement and they make sense to people, unlike questions about asset allocation (or compression ratios).

Besides creating a simple design with only a handful of relevant choices, we need a design that does not change, at least in the way that users interact with it. An unchanging design leads to tools that people will be more likely to learn and use. In fact, a design that is unchanging is almost as important as a design that is simple.

For example, I have been driving for 50 years and during that time the steering wheel in cars has not changed, even though automobile designers could have replaced steering wheels with joysticks. They have been careful to keep the car familiar so that users do not have to relearn how to drive each time they buy a new car.

The lesson is that something simple and consistent is easier for people to learn and remember than something complicated and changing. The goal is to be innovative without disturbing the user’s experience. Planning for retirement is complex and it can be made even more difficult if the tools are difficult to use.

But ensuring ease of use for the individual does not rule out building in significant complexity and flexibility under the bonnet, including continuing innovation to improve the plan’s performance.

We must, therefore, design a system that is user friendly, one that people can become familiar with and thus are willing to use — a system in which the designers do the heavy lifting, so users need only make lifestyle decisions that they understand and the system then translates into the investment actions needed to achieve those goals.
Yet most of the models used to develop DC plans implicitly assume that numerous decisions are fixed, independent of changing market, personal or technological conditions. That is not an optimal design at all.

We must, therefore, design a system that is user friendly, one that people can become familiar with and thus are willing to use — a system in which the designers do the heavy lifting, so users need only make lifestyle decisions that they understand and the system then translates into the investment actions needed to achieve those goals.

The optimal strategies should guide users to arrive at their target retirement goals smoothly. The system will maximise the prospects of achieving a desired standard of living, subject to a risk constraint of a ‘minimum or essential life income’ amount in retirement.

Again, this is done in a way that provides meaningful choices to the individual, not just at the beginning of the process but all along the journey.

For example, when someone is diagnosed as having high cholesterol, their doctor does not deliver a lecture on the biochemistry of the cardiovascular system. Instead, he gives them a list of things they can do to improve their health — such as giving up smoking, losing a few pounds and starting a fitness program.

So it is the same with reforming our retirement system. When the individual’s plan is running off course — that is, it looks very unlikely to be able to generate their desired target income goal — they are given three simple-to-understand choices of action:

1. Increase their contribution rate (save more);
2. Increase their retirement age (work longer); or
3. Take more risk.

Those are all the choices — simple and stark, but effective. Other than lowering the goal itself, there are no other ways of addressing this problem.

However, optimisation is not simply about ensuring a desired level of retirement income. It is also about the efficiency or effectiveness in achieving that goal. Just as it is possible to save too little for retirement, it is also possible to save too much and face the regret of forgone consumption opportunities during the many years before retirement.

Despite these complexities, I am optimistic that such systems are doable, not with futuristic tools but with technology and tools that are available today. Indeed, such a next-generation system is commercially available today.

**Technology and tools for creating products**

The paradox of the type of system I have just described is that the simpler and easier it is for retirees to use, the more complex it is for its producer. The dynamic trading and risk assessment needed for the next-generation plan require sophisticated models, tools and trading capability, none of which needs to be explained to the individual.

Interestingly, the mean-variance portfolio model is still the core of most professional investment management models, even for sophisticated institutions. Certainly, it has been updated since its first use in the 1950s, but it is a tribute to Harry Markowitz and William Sharpe that it is still at the core of thinking about risk and return in practice.

But to design the next generation of retirement products, designers must consider explicitly some of the other dimensions of risk.

**Human capital**

Assume that a university professor and a stockbroker have the same present value of their human capital and the same financial capital. Their risk tolerances are also the same. When deciding which of the two should hold more stocks in their portfolio, most people intuitively respond that the stockbroker should. After all, stockbrokers typically know a lot more about stocks than professors do.

But, if we consider their situations more closely, we realise that the stockbroker’s human capital is far more sensitive to the stock market than is the professor’s. Therefore, to achieve the same total wealth risk position, the stockbroker should actually put less of his or her financial wealth into stocks.

Most models today take into account the value of human capital, but few consider the risk of human capital or how human capital is related to other assets. Since a significant component of retirement-dedicated assets is future contributions to the member’s DC account and those contributions are linked directly to the future earnings of the member, taking account of both the magnitude and risk of that human capital asset is essential to a well-designed solution.

**Wealth versus sustainable income as the goal**

The second dimension is the use of wealth as a measure of economic welfare.

To illustrate, consider two alternative scenarios faced by the individual. In one, there are assets worth $10 million. In the other, there are assets worth $5 million. The environment with $10 million can earn an annual riskless real rate of 1 per cent. The one with $5 million can earn an annual riskless real rate of 10 per cent. Which is preferable?

Of course, if all wealth is to be consumed immediately, the $10 million alternative is obviously better.

At the other extreme, suppose the plan is to consume the same amount in perpetuity. A few simple calculations reveal that the $5 million portfolio will
produce a perpetual annual inflation-protected income of $500,000 and that the $10 million portfolio will produce only $100,000. So, with a long-enough horizon for consumption, the $5 million environment is preferable, because of the more favourable investment opportunity environment.

The ‘crossover’ time horizon for preference between the two is at about 10 years. Thus, we see that wealth alone is not sufficient to measure economic welfare.

How many advice engines take this dimension of a changing investment opportunity environment into account? Many such engines quote retirement income as an end goal, but in doing so they take an estimated wealth amount and simply apply the annuity formula to it, as if there were no material uncertainty about future interest rates.

How plans are framed and how their values and risks are reported (wealth versus lifetime income units) is thus not trivial. The proper unit of account selected is essential for conveying what is risky and what is not, and thus for making appropriate portfolio allocations.

**Essential and desired income goals**

The system I am describing seeks to increase the likelihood of reaching nominated income goals by sacrificing the possibility of doing significantly better than desired. In a nutshell, we are narrowing the distribution curve of possible outcomes. We do this by setting desired and essential target income goals. Let me explain.

For an unengaged member, the desired and the essential target income goals are set by the plan sponsor under the advice of professional consultants. The goals are based on what a member with a given profile would likely see as a good retirement income and on how much risk would be acceptable in trying to achieve that goal. (These same default settings are available as guidelines to members who do become engaged and can be modified by the members to better fit their individual circumstances.)

The level of the desired target is set as an estimate of the inflation-protected income necessary to maintain a comfortable standard of living. The essential target is defined as a level of income that while not guaranteed, has a very high probability of being achieved (>96 per cent), and which serves to indicate the degree of risk of the member’s strategy.

Both levels must satisfy feasibility conditions.

The goal is to maximise the estimated probability of achieving the desired target income level, subject to meeting the highly probable conditions of the essential target income level. As the essential target income level increases, the risk of the strategy must fall, but so does the likelihood of achieving the desired target income level.

If the amount of retirement-dedicated assets reaches a level at which the estimated probability of the desired target income level being achieved exceeds 96 per cent, the allocation reduces risk as much as possible so as to maximise the chances of achieving the goal at retirement. This is called ‘lock in’.

In effect, by taking as much risk as possible off the table when it is no longer needed, we are trading off the possibility of achieving ‘even more’ against increasing materially the probability of achieving the goal. Or, put another way, the strategy is focused entirely on achieving the goal subject to the essential income and gives no weight to achieving more than the goal.
In effect, by taking as much risk as possible off the table when it is no longer needed, we are trading off the possibility of achieving ‘even more’ against increasing materially the probability of achieving the goal. Or, put another way, the strategy is focused entirely on achieving the goal subject to the essential income and gives no weight to achieving more than the goal.

The combination of the essential target income limiting the downside and lock-in cutting off the upside significantly narrows the distribution of possible outcomes relative to traditional DC asset allocation strategies, such as the glidepaths of target-date funds. At the same time, it increases the estimated probability of reaching the desired outcome, relative to these less-focused strategies. Indeed, target-date funds rarely express an explicit investment goal. Instead, they simply specify an investment process through their age-dependent glidepath asset allocation schedules.

If at any time the member’s progress suggests their probability of reaching the desired target income goal is below a specified threshold — say 50 per cent or less — the system gets in touch with them, tells them that they have a problem and provides them with the three actions they can take to improve their chances of success — increase their monthly contributions, raise their retirement age and/or take more risk (similar to a doctor after a health check-up).

These pension alerts during the member’s accumulation period also formally document the systematic process under which the plan sponsor and trustees, as part of their fiduciary responsibilities, sought to guide that member to a good retirement outcome.

**Conclusion**

In designing a new retirement system, first we need to define our goal. We have decided that our goal is to help participants achieve inflation-protected income throughout retirement.

While the traditional DB retirement system is no longer sustainable, its typical DC replacement requires individuals to make overly complex decisions and bombards them with jargon that is meaningless to them.

What I have mapped out is a fully integrated system that moves the goal from amassing a lump sum to achieving a retirement income for life. Asset allocation strategies are personalised. And, each participant is given regular updates on how they are travelling in ways that make sense to them.

Unlike simple target-date funds that mechanically set the asset allocation using a crude calculation based on a single variable — the participant’s age — we have created a customised, dynamically managed solution based on each participant’s tailored goals for desired outcomes, life situation, expected future contributions and other retirement-dedicated assets, including current DC accumulations, any DB benefits, and age pension benefits.

To improve effectiveness of engagement, all of the complexity is kept under the bonnet. The user is asked a series of simple questions around their essential and their desired income targets. Once they achieve a very strong likelihood (more than 96 per cent) of reaching that desired income, they lock in an asset allocation to match the purchase of that desired lifetime income at retirement.

This is not a hypothetical system. It is already in place in Europe and is being introduced in the United States. And, it begins and ends with turning the focus back onto what superannuation should be about — ensuring people have adequate incomes in retirement.
Keywords: S&P/ASX 200 Index, index effects, S&P game, strategic trading.

S&P/ASX 200:
Does change in membership matter?

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CHRIS TERRY, Finance Discipline Group, University of Technology, Sydney

Studies over recent decades of the return effects for the stocks added to and deleted from the S&P 500 have documented the so-called ‘S&P game’, where traders could profit from stock price reactions to changes in the index’s composition. Studies on the All Ordinaries Index covering the 1990s also found profitable trading opportunities over the pre-announcement period. Our study of the effects of changes in the composition of the S&P/ASX 200 from its introduction (in April 2000) to June 2009 found these pre-announcement opportunities were eliminated but that potential exists for the ‘S&P/ASX 200 game’ between announcement and implementation dates.

There is extensive literature on the price reactions to changes in the composition of the S&P 500. The literature was influenced by the emergence of index funds in the late 1970s and the price pressure generated by their trading to rebalance their portfolios when changes to the index are implemented (to minimise their tracking error). The reported average abnormal returns (AARs) on announcement dates ranged around 3 per cent for the period September 1976 to September 1989 (Harris and Gurel 1986; Shleifer 1986; Jain 1987). In October 1989 Standard and Poor’s began to pre-announce changes to the composition of the S&P500, which gave rise to the ‘S&P game’ (Beneish and Whaley 1996); buying on the announcement and selling on implementation dates. Chen, Noronha and Singal (2004) found AARs on announcement dates of 5.4 per cent that increased on a cumulative basis to 8.9 per cent by implementation dates for additions using data for the period October 1989 to December 2000. But Soe and Dash (2008) found that index effects shrank during the 2000s decade. This study reported cumulative average abnormal returns (CAARs) of only 1.75 per cent for additions (between the first day of trading following the announcements and implementation dates) using data for the period September 2003 to August 2008. This finding is attributed in part to the rebalancing of portfolio trading by index (and similar) funds being spread over the days prior to implementation dates rather than being concentrated on implementation dates (Green and Jame 2011).

There are a number of theoretical motivations for the US literature on index effects. These include a test for market efficiency (assuming changes in the composition of the index are information-free events there should be no price effects) and, given the evidence of return effects, what are their main explanations? The latter include the price-pressure hypothesis that portfolio-rebalancing trades by index funds would explain asymmetric effects prior to and after implementation dates (i.e. the CAARs are reversed). However, most studies have found the return effects are not reversed or are only partially reversed. This pattern is explained by various hypotheses, including the information-content hypothesis (that membership of the index does matter to share value), the investor-awareness hypothesis (which could explain permanent price effects for additions but a reversal in negative abnormal returns for deletions, given the market’s continued knowledge of the deleted firms) and the liquidity hypothesis (that the supply of free float is diminished by holdings of index funds for additions, and is increased for deleted firms). However, a review of this debate is beyond the scope of this paper (see Chen, Noronha and Singal 2004).

In contrast with the US literature, we were able to find only two published papers on index effects in Australia, along with several working papers. The initial studies (in the late 1990s) of index effects in Australia were based on the previous All Ordinaries Index (AOI). This was an open-ended index comprised of shares that met the selection criteria. During the 1990s the number of shares included in the AOI ranged from 229 to 330.
The selection criteria comprised a minimum market capitalisation (0.022 per cent of the market’s total capitalisation) and a liquidity (i.e. trading volume) requirement (the turnover of the shares needed to exceed a specified percentage of the issued capital) over the six-month period prior to each review of the index’s composition. Deletions were made when shares failed to satisfy the minimum capitalisation and liquidity requirements, although in July 1998 a system of down-weighting (implemented quarterly) was applied to the market capitalisation of companies with adequate capitalisation (to remain in the index) but inadequate liquidity. The quantitative criteria for additions and deletions would allow investors to make front-running trades in anticipation of upcoming changes to the index. Moreover, changes to the composition of the index were announced in the ASX’s monthly publication, *Monthly Index Analysis*, usually two weeks prior to their implementation (Chan and Howard 2002).

Chan and Howard (2002) reported AOI index effects (on a daily basis) over the period January 1995 to July 1998. This study uses a window of -60 days to +60 days around implementation dates. The study reports CAARs of over 10 per cent from day -60 to day 0 for additions (with just over half coming during the latter half of this period) and -30 per cent for deletions over this period (over two-thirds coming during the latter half of this period). The returns data are consistent with both momentum and front-running trades prior to implementation dates. The study found AARs of 2.6 per cent for the additions to the AOI on day -1 (i.e. the day before implementation dates) and -3.3 per cent on day -1 and +2.6 per cent on day 0 for deletions, which is interpreted (along with elevated trading volume data) as evidence of trading by index funds to rebalance their portfolios the day before implementation dates. Finally, the study found the CAARs for additions are partially reversed (to 6 per cent) over the 60-day period following implementation dates, whereas the negative CAARs for deletions stabilised over this period.

An unpublished paper by Aitken and Comerton-Forde (1999) reported index effects over the period December 1993 to December 1998. The study found AARs for additions of 0.96 per cent on day -1 (the day prior to the implementation dates) along with slightly greater AARs for deletions of -1.71 per cent on day -1. Over its day -20 to day +20 window the study found minimal CAARs for additions, whereas the CAARs for deletions were -8.10 per cent from day -20 to day 0 after which they rose to 2.37 per cent by day +20. The complete reversal in the negative CAARs contradicted industry claims at the time that deletion from the AOI would further lower share values. The finding is also at odds with those of Chan and Howard (2002) noted above.

In April 2000 the S&P-designed indices were introduced and the AOI was redesigned to comprise 500 shares. The S&P/ASX 200 was designed to become a tradeable benchmark index with a fixed number of companies and their continuing eligibility to remain in the index is reviewed quarterly by the index committee in terms of float-adjusted market capitalisation and liquidity requirements (over the previous six months). The committee determines first whether any shares should be removed from the index given their capitalisation and liquidity performance. Removal, however, is not automatic; it is dependent on the committee’s decision, which also reflects its aims in managing the index’s composition. The committee then selects which eligible securities will be included. The changes are announced on the first Friday of each quarter (March, June, September and December) and (usually) implemented on the third Friday (i.e. 10 business days later), (S&P 2010). Consequently, it has become more difficult for the market to anticipate the changes prior to announcement dates.

The principal contribution of our study is to fill the gap in the index effects literature by investigating the S&P/ASX 200 and it does so over a substantial period, from its introduction in April 2000 up to June 2009. An earlier paper (Pinfold and Qiu 2008) presented the findings of a study on the index effects for the S&P/ASX 100 and 300 indices, covering the period from April 2000 to December 2003. It identified modest effects that were not statistically significant.

**Data and methodology**

Our study used an event window of 61 days evenly distributed around the event date i.e. from -30 to +30 days relative to announcement dates. A data set was developed from Standard and Poor’s website and from its press releases. There were 237 additions to, and 239 deletions from, the S&P/ASX 200 over the period of the study. Firms were deleted from the study’s data set if they had listed on the ASX within six months prior to the event date, had been added to the indices due to consolidation or firm spin-offs or had been removed from the indices for reasons other than breach of the size or liquidity conditions (such as corporate events). In addition, firms which had delisted within the event period, subsequent to removal from either index, were not included even though this introduces a potential survivorship bias. As a result, the study’s sample comprises 126 additions to, and 109 deletions from the S&P/ASX 200.

Price histories, trading volumes and the number of each company’s shares were obtained from Bloomberg and DataStream. Specifically, the daily adjusted closing prices were utilised, which accounts for all corporate actions such as stock splits, dividends/distributions and rights offerings. This is appropriate when analysing
historical stock returns as it provides an accurate representation of the firm’s share value beyond the simple market price.

We use a control firm (CF) approach to measure the impact of the index events on the returns of the added and deleted firms. The methodology measures abnormal returns as the movement in a firm’s share price relative to a CF’s share price. The CF is selected from the firms in the same industry that are of a comparable size (i.e. market capitalisation). The abnormal returns are calculated on a daily basis as follows:

\[ AR_{it} = R_{it} - R_{ic,t} \]

where:

- \( R_{it} \) = the rate of return on the stock of sample firm \( i \) on day \( t \),
- \( R_{ic,t} \) = the rate of return on the stock of the control firm for firm \( i \) on day \( t \),

Where possible, the control firms were in the same industry within the Global Industry Classification System (GICS) code. The GICS codes comprise four levels: sector, industry group, industry and sub-industry, with each level denoted by two digits. The firms were not matched based on their sub-industry as this identification system is extremely narrow.

The average market capitalisation was determined for each sample firm under examination, based on its historical market capitalisation over the six months prior to the event period (which we define as -30 to +30 days either side of the index event day). An appropriate match was determined using upper and lower bounds of 70 per cent and 130 per cent of the sample firm’s market capitalisation. Approximately 75 per cent of the control firms were selected on this basis. If a firm within this range did not exist then the industry basis was broadened to a list of all firms within the same industry group (the four-digit GICS codes). The remaining CFs (approximately 20 per cent) were those with the closest market capitalisation value to the sample firm; provided the CFs had not been added to, or deleted from the index in the eight months prior to, or after the event period (to ensure the abnormal return calculations were not biased by their upward or downward price movement that influenced their addition or deletion from the index). Moreover, the CFs for both additions and deletions had very similar mean market capitalisations to those for the firms in the study.

Results and their interpretation

The CAARs for additions over the study’s overall event window, from day -30 to day 30 (relative to announcement dates) are presented in Figure 1. Observe that the CAARs for the period day -30 to day 0 amounted to just over 1 per cent (although they rose to 3 per cent during this period). Such a small movement indicates that the upcoming additions to the index were not anticipated by the market. This finding contrasts with CAARs found by Chan and Howard (2002) over the same window for additions to the AOI and supports the conclusion that the selection of shares to be added to the S&P/ASX 200 has eliminated the ‘risk-arbitrage’ trading opportunities provided by the AOI. This conclusion is consistent with the findings of Pinfold and Qiu (2008) for the S&P/ASX 300.

Table 1: S&P/ASX 200 additions announcement date stock price effects, 2000 to 2009

<table>
<thead>
<tr>
<th>Day</th>
<th>AAR (%)</th>
<th>t-statistic</th>
<th>Rank Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>-10</td>
<td>0.69</td>
<td>1.62</td>
<td>5.05***</td>
</tr>
<tr>
<td>-9</td>
<td>-0.45</td>
<td>-1.14</td>
<td>-1.43</td>
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<td>-0.34</td>
<td>-0.87</td>
<td>-1.06</td>
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<tr>
<td>-7</td>
<td>-0.25</td>
<td>-0.75</td>
<td>0.23</td>
</tr>
<tr>
<td>-6</td>
<td>0.26</td>
<td>0.59</td>
<td>-0.04</td>
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<tr>
<td>-5</td>
<td>-0.42</td>
<td>-1.00</td>
<td>-3.02***</td>
</tr>
<tr>
<td>-4</td>
<td>0.47</td>
<td>1.08</td>
<td>2.93**</td>
</tr>
<tr>
<td>-3</td>
<td>0.13</td>
<td>0.31</td>
<td>0.85</td>
</tr>
<tr>
<td>-2</td>
<td>-0.96</td>
<td>-1.68*</td>
<td>-5.30***</td>
</tr>
<tr>
<td>-1</td>
<td>-0.34</td>
<td>-0.90</td>
<td>-1.56</td>
</tr>
<tr>
<td>0</td>
<td>1.66</td>
<td>1.99**</td>
<td>10.86***</td>
</tr>
<tr>
<td>1</td>
<td>1.66</td>
<td>4.28***</td>
<td>9.85**</td>
</tr>
<tr>
<td>2</td>
<td>-0.22</td>
<td>-0.47</td>
<td>-1.11</td>
</tr>
<tr>
<td>3</td>
<td>0.06</td>
<td>0.14</td>
<td>0.65</td>
</tr>
<tr>
<td>4</td>
<td>0.02</td>
<td>0.05</td>
<td>0.91</td>
</tr>
<tr>
<td>5</td>
<td>0.06</td>
<td>0.12</td>
<td>0.30</td>
</tr>
<tr>
<td>6</td>
<td>0.30</td>
<td>0.93</td>
<td>2.97***</td>
</tr>
<tr>
<td>7</td>
<td>0.28</td>
<td>0.82</td>
<td>2.64***</td>
</tr>
<tr>
<td>8</td>
<td>1.13</td>
<td>3.27***</td>
<td>7.79***</td>
</tr>
<tr>
<td>9</td>
<td>0.66</td>
<td>1.71*</td>
<td>2.85**</td>
</tr>
<tr>
<td>10</td>
<td>0.30</td>
<td>0.62</td>
<td>-0.91</td>
</tr>
</tbody>
</table>

This table reports the average abnormal returns (AAR) for the period day -10 to day +10 relative to the announcement date of additions to the S&P/ASX 200 index during 2000 to 2009. Statistical significance at the 1%, 5% and 10% levels is indicated by ***, ** and *, respectively, for two-tailed tests using either the Student’s t-test or the non-parametric Wilcoxin-Signed Rank Test.
FIGURE 1: Additions to the S&P/ASX 200 – This figure shows the CAAR for the period day -30 to day 30 relative to the announcement dates

FIGURE 2: Trading volumes for additions to the S&P/ASX 200 for the period day -30 to day 30 relative to the announcement dates

TABLE 2: S&P/ASX 200 additions announcement date stock price effects for windows within the event period, 2000 to 2009

This table reports the cumulative average abnormal returns (CAAR) for windows within the period day -30 to day +30 relative to the announcement date of additions to the S&P/ASX 200 during 2000 to 2009.

Statistical significance at the 1%, 5% and 10% levels is indicated by ***, ** and *, respectively, for two-tailed tests using the Student’s t-test.

<table>
<thead>
<tr>
<th>Window</th>
<th>CAAR (%)</th>
<th>t-statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>(-20,-1)</td>
<td>0.85</td>
<td>0.48</td>
</tr>
<tr>
<td>(-10,-1)</td>
<td>-1.21</td>
<td>-0.94</td>
</tr>
<tr>
<td>(-1,+1)</td>
<td>2.98***</td>
<td>3.22</td>
</tr>
<tr>
<td>Announcement Day</td>
<td>1.66**</td>
<td>1.99</td>
</tr>
<tr>
<td>(+1,+10)</td>
<td>4.25***</td>
<td>3.31</td>
</tr>
<tr>
<td>(+1,+20)</td>
<td>2.15</td>
<td>1.39</td>
</tr>
<tr>
<td>(-30,+30)</td>
<td>3.27</td>
<td>1.10</td>
</tr>
</tbody>
</table>

TABLE 3: S&P/ASX 200 additions implementation date stock price effects, 2000 to 2009

This table reports the average abnormal returns (AAR) for the period day -1 to day +1 relative to the implementation date of additions to the S&P/ASX 200 index during 2000 to 2009.

Statistical significance at the 1%, 5% and 10% levels is indicated by ***, ** and *, respectively, for two-tailed tests using either the Student’s t-test or the non-parametric Wilcoxin-Signed Rank Test.

<table>
<thead>
<tr>
<th>Day</th>
<th>AAR (%)</th>
<th>t-statistic</th>
<th>Rank Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1</td>
<td>2.15</td>
<td>4.09**</td>
<td>8.93***</td>
</tr>
<tr>
<td>0</td>
<td>-0.76</td>
<td>-1.66*</td>
<td>-3.62***</td>
</tr>
<tr>
<td>1</td>
<td>-0.33</td>
<td>-0.85</td>
<td>-1.82*</td>
</tr>
</tbody>
</table>

This table reports the cumulative average abnormal returns (CAAR) for windows within the period day -30 to day +30 relative to the announcement date of additions to the S&P/ASX 200 during 2000 to 2009.
We found CAARs (shown in Table 2) for the period day +1 to day +10 of 4.25 per cent (statistically significant at the 1 per cent level) on the days prior to the implementation date. These CAARs indicate the potential for the ‘S&P/ASX 200 game’ of buying on the announcement and selling prior to implementation dates. The pattern is also consistent with portfolio rebalancing trading over the days prior to implementation dates. Evidence of such trading was found by Aitken, Ho and Walter (2000) and by Frino, Gallagher and Oetomo (2005). The latter study of a representative sample of large and enhanced-index funds found their trading in the added and deleted shares commenced five to 12 days prior to implementation dates and were largely completed by implementation dates.

The CAARs data for the last 20 days of our study window partially reversed the level achieved just prior to implementation dates. The findings provide partial support for the price-pressure hypothesis (reflecting the cessation of buying by index funds and selling pressure from frontrunning traders who purchased on or immediately after announcement dates). They also provide partial support for the explanations that the price effects are permanent.

Our study found larger AARs for deletions producing a larger asymmetric pattern of CAARs before and after announcement dates. We found (see Table 4) AARs of -3.11 per cent (statistically significant at the 1 per cent level) on announcement dates. The data in Table 5 show the CAARs over the day -20 to day -1 window of -12.43 per cent (significant at the 1 per cent level). The data in Table 6 show that there were negative abnormal returns on the day before the implementation dates but positive AARs (2.54 per cent) on implementation dates, which marked the beginning of a partial reversal in the returns. This return reversal is displayed by the data in Table 5 for the period day +1 to day +20 relative to announcement dates and, in Figure 3, for the 30-day period after announcement dates. The elevated trading volume data for deletions presented in Figure 4 are consistent with increased selling pressure for the 10-day period starting from announcement dates.

The negative AARs prior to announcement dates could be influenced by market participants frontrunning the announcements. Alternatively, the negative returns may simply reflect the poor performance of the stocks that are being removed from the index. The negative CAARs between announcement and the day before implementation dates, and the accompanying elevated trading volumes, are consistent with index funds selling deleted shares. The reversal in CAARs from implementation dates is not consistent with industry claims that deletion from the index causes further

### Table 4: S&P/ASX 200 deletions announcement date stock price effects, 2000 to 2009

<table>
<thead>
<tr>
<th>Day</th>
<th>AAR (%)</th>
<th>t-statistic</th>
<th>Rank Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>-10</td>
<td>-1.54</td>
<td>-2.93 ***</td>
<td>-8.79 ***</td>
</tr>
<tr>
<td>-9</td>
<td>-0.87</td>
<td>-1.66 *</td>
<td>-3.47 ***</td>
</tr>
<tr>
<td>-8</td>
<td>-0.16</td>
<td>-0.28</td>
<td>-1.85</td>
</tr>
<tr>
<td>-7</td>
<td>-1.19</td>
<td>-2.38 **</td>
<td>-5.35 ***</td>
</tr>
<tr>
<td>-6</td>
<td>-0.82</td>
<td>-1.83 *</td>
<td>-4.75 ***</td>
</tr>
<tr>
<td>-5</td>
<td>-1.18</td>
<td>-2.33 **</td>
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<td>-2.13 **</td>
<td>-3.79 ***</td>
</tr>
<tr>
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<td>-0.05</td>
<td>-0.09</td>
<td>-1.54</td>
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<tr>
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<td>-0.69</td>
<td>-1.23</td>
<td>-2.38 **</td>
</tr>
<tr>
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<td>-3.11</td>
<td>-5.72 ***</td>
<td>-13.43 ***</td>
</tr>
<tr>
<td>1</td>
<td>-1.05</td>
<td>-1.68 *</td>
<td>-2.46 ***</td>
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<td>2</td>
<td>-0.15</td>
<td>-0.21</td>
<td>-3.04 ***</td>
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<td>-5.88 ***</td>
</tr>
<tr>
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<td>-0.32</td>
<td>-3.34 ***</td>
</tr>
<tr>
<td>5</td>
<td>1.22</td>
<td>1.29</td>
<td>-0.29</td>
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<tr>
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<td>-0.39</td>
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<td>-0.51</td>
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<td>8</td>
<td>-0.71</td>
<td>-1.31</td>
<td>-3.28 ***</td>
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<td>9</td>
<td>-1.19</td>
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<td>-2.95 ***</td>
</tr>
<tr>
<td>10</td>
<td>-2.21</td>
<td>-1.47</td>
<td>-2.32 **</td>
</tr>
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</table>

This table reports the average abnormal returns (AAR) for the period day -10 to day +10 relative to the announcement date of deletions from the S&P/ASX 200 index during 2000 to 2009. Statistical significance at the 1%, 5% and 10% levels is indicated by ***, ** and *, respectively, for two-tailed tests using either the Student’s t-test or the non-parametric Wilcoxon-Signed Rank Test.

### Table 5: S&P/ASX 200 deletions announcement date stock price effects for windows within the event period, 2000 to 2009

<table>
<thead>
<tr>
<th>Window</th>
<th>CAAR (%)</th>
<th>t-statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>(-20,-1)</td>
<td>-12.43 ***</td>
<td>-4.29</td>
</tr>
<tr>
<td>(-10,-1)</td>
<td>-9.33 ***</td>
<td>-4.55</td>
</tr>
<tr>
<td>(-1,+1)</td>
<td>-4.85 ***</td>
<td>-4.56</td>
</tr>
<tr>
<td>Announcement Date</td>
<td>-3.11 ***</td>
<td>-5.72</td>
</tr>
<tr>
<td>(+1,+10)</td>
<td>-5.86 ***</td>
<td>-2.30</td>
</tr>
<tr>
<td>(+1,+20)</td>
<td>1.04</td>
<td>0.38</td>
</tr>
<tr>
<td>(-30,+30)</td>
<td>-15.20 ***</td>
<td>-4.01</td>
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</table>

This table reports the cumulative average abnormal returns (CAAR) for windows within the period day -30 to day +30 relative to the announcement date of deletions from the S&P/ASX 200 during 2000 to 2009. Statistical significance at the 1%, 5% and 10% levels is indicated by ***, ** and *, respectively, for two-tailed tests using the Student’s t-test.
FIGURE 3: S&P/ASX deletions – This figure shows the CAAR for the period day -30 to day 30 relative to the announcement dates

FIGURE 4: S&P/ASX deletions – This figure shows the AAVs for the period day -30 to day 30 relative to the announcement dates

TABLE 6: S&P/ASX 200 deletions implementation date stock price effects, 2000 to 2009

<table>
<thead>
<tr>
<th>Day</th>
<th>AAR (%)</th>
<th>t-statistic</th>
<th>Rank Test</th>
</tr>
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<tbody>
<tr>
<td>-1</td>
<td>-3.46</td>
<td>-2.34**</td>
<td>-6.83***</td>
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<tr>
<td>0</td>
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<td>1.97*</td>
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<td>1</td>
<td>0.86</td>
<td>1.47</td>
<td>2.70***</td>
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</table>

This table reports the average abnormal returns (AAR) for the period day -1 to day +1 relative to the implementation date of deletions from the S&P/ASX 200 index during 2000 to 2009.

Statistical significance at the 1%, 5% and 10% levels is indicated by ***, ** and *, respectively, for two-tailed tests using either the Student’s t-test or the non-parametric Wilcoxin-Signed Rank Test.
price falls. The finding may be explained by the cessation of selling by funds having rebalanced their portfolios. It may also reflect buying pressure from investors who believed the shares had become undervalued because of their deletion. According to the investor-awareness hypothesis, investors remain aware of recently deleted shares (because they had been in the index) and so recognise any underpricing following their deletion from the index.

Conclusions

There are a number of findings from our study. First, the introduction of the S&P/ASX 200 replaced the potential for profitable front-running trades prior to announcement dates (that were evident with the AOI) with the potential for profitable frontrunning trades following announcement dates and selling prior to implementation dates.

Second, deletions from the index display poor performance prior to their announcement dates but their CAARs are partially reversed following implementation dates. This indicates that the act of deletion does not cause further falls in their price performance.

The recent literature on the S&P 500 indicates its index effects are shrinking and, during the mid-2000s, have become smaller than those reported in our study for the period between announcement and implementation dates. Consequently, we conclude that being added to the index matters (abnormal returns are only partially reversed following implementation dates) whereas being deleted from the index is followed by a partial recovery in returns. ■

Notes
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References
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Standard & Poor’s (2010), S&P/ASX Australian Indices Methodology, January
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The recent financial crisis has thrown a spotlight on credit risk. Although credit risk is generally priced as a function of firm leverage and volatility, Alexander and Kaeck (2008) show that during volatile periods, credit spreads are driven by different factors from those in stable markets. Duffie and Lando (2001) argue that creditors also have incomplete information and will demand a premium if they are unable to assess valuation parameters with precision. Furthermore, Korteweg and Polson (2010) find that parameter uncertainty varies over time and increases significantly during periods of market stress. Guntay and Hackbarth (2010) use the dispersion in earnings forecasts of equity analysts as a proxy for this valuation uncertainty and find that higher dispersion leads to higher credit spreads in the US corporate bond market.

This study contributes to the existing literature by investigating the impact of value uncertainty on the pricing of Australian credit risk during the global financial crisis. We use equity analysts’ one-year-ahead price target forecasts as a proxy for uncertainty and measure credit risk with corporate credit default swap (CDS) spreads. CDS spreads are less likely to be constrained by data availability issues usually associated with studies using Australian bonds (see for example, Creighton, Gower and Richards 2007). CDS spreads also do not require the selection of a benchmark risk-free interest (Blanco, Brennan, and Marsh 2005). With the exception of Callen, Livnat and Segal (2009), and Melgarejo (2010), who use US data and lower sampling frequency, there is scant literature on the impact of equity analysts’ forecasts on CDS spreads and, to our knowledge, this is the first empirical study that extends the analysis to the financial crisis.

Analysis

Determinants of CDS spreads

To the extent that information contained in analysts’ forecasts reduces information asymmetry between the market and the firm, we hypothesise that greater uncertainty among equity analysts will reduce transparency in the pricing of securities, with resulting uncertainty leading to higher CDS spreads. We control for common firm-level variables that have been previously documented in the literature. Due to the short and volatile time period covered by our data we have little guidance on the precise functional relationship between the variables. Furthermore, as Guntay and Hackbarth (2010) argue, relying purely on the cross-sectional relation between credit spread levels and analysts’ forecast dispersion may provide a noisy indicator of the underlying relationship. Consequently, we construct two regression models to test our hypothesis both in differences and levels. The regression specification for CDS levels for firm \( i \) at week \( t \) is:

\[
CDS_{it} = \beta_0 + \beta_1 \text{Target}_{it} + \beta_2 \text{StDTarget}_{it} + \beta_3 \text{Leverage}_{it} + \beta_4 \text{Leverage}_{it} \times D + \beta_5 \text{5ySwap}_{it} + \beta_6 \text{Vol}_{it} + \beta_7 \text{CreditRating\{A\}}_{it} + \beta_8 \text{CreditRating\{BBB\}}_{it} + u_{it} \tag{1}
\]
The regression of the weekly changes in CDS spreads takes first differences of the variables measured in percent terms, and percentage changes of variables that are measured in dollar values (e.g. share price). With a sufficiently similar investment rating across the issuers we specify raw changes in CDS spreads as our dependant variable.

\[ \Delta \text{CDS}_{it} = \beta_0 + \beta_1 \Delta \text{Target}_{it} + \beta_2 \Delta \text{StDTarget}_{it} + \beta_3 \text{StockReturn}_{it} + \beta_4 \Delta 5y\text{Swap}_{it} + \beta_5 \Delta \text{Vol}_{it} + \beta_6 \text{CreditRating}_{it} + \nu_{it} \]  

(2)

The regression variables are summarised below.

<table>
<thead>
<tr>
<th>Control Variable</th>
<th>Variable description</th>
<th>Expected coeff. sign</th>
</tr>
</thead>
<tbody>
<tr>
<td>Target</td>
<td>Mean price target for stock i across the analysts at week t divided by the current stock price</td>
<td>–</td>
</tr>
<tr>
<td>( \Delta \text{Target} )</td>
<td>Weekly percentage change in Target</td>
<td></td>
</tr>
<tr>
<td>( \Delta \text{StDTarget} )</td>
<td>Weekly cross-sectional standard deviation of analyst price targets for stock i across the equity analysts covering the firm</td>
<td>+</td>
</tr>
<tr>
<td>( \Delta \text{StDTarget} )</td>
<td>Weekly percentage change in ( \Delta \text{StDTarget} )</td>
<td></td>
</tr>
<tr>
<td>Leverage</td>
<td>Semi-annually reported total liabilities expressed as a percentage of the firm’s week t stock market capitalisation</td>
<td>+</td>
</tr>
<tr>
<td>( \Delta \text{Vol} )</td>
<td>First difference in ( \Delta \text{Vol} )</td>
<td></td>
</tr>
<tr>
<td>( \Delta \text{Vol} )</td>
<td>Option-implied volatility calculated from options with at least one week to maturity</td>
<td>+</td>
</tr>
<tr>
<td>CreditRating</td>
<td>Firm’s credit rating. Due to the small number of credit events, we aggregate the credit ratings into three buckets: (AA+, AA, AA-) and BBB with dummy variables included for the last two categories based upon each firm’s median rating across the three rating agencies in week t</td>
<td>Rel. to AA rating</td>
</tr>
<tr>
<td>StockReturn</td>
<td>Return on the equity of firm i for week t</td>
<td>–</td>
</tr>
</tbody>
</table>

Data

The CDS dataset is provided by Markit Partners and consists of companies in the Australian CDS iTraxx Index (Series 16) with traded options on the Australian Securities Exchange (ASX). It includes end-of-day midpoint quotes in basis points (bps) for 22 corporations. The reference entities reflect approximately two-thirds of the ASX 200 market capitalisation. We focus on spreads during the financial crisis period, which we identify as being between 1 January 2006 and 31 December 2010. To ensure sufficient liquidity, we use senior debt five-year CDS contracts, which represent the majority of single-name CDS traded volume.

The equity analyst target price forecasts are obtained from Institutional Brokers Estimates System (I/B/E/S). To eliminate stale data we remove individual analyst forecasts if they have not been updated for at least three months. Our filter eliminates approximately 1 per cent of the individual analyst forecasts. The median number of analysts covering a firm ranges from 5 to 11 with an average of 9. Put option-implied volatilities, and total liabilities per share for each firm are sourced from Bloomberg. Five-year swap rates are obtained from the Australian Financial Markets Association (AFMA). Credit rating announcements by Moody’s, Standard & Poor’s, and Fitch are obtained from Thomson Reuters. We consider all long-term rating events. We do not distinguish between rating agencies, or whether it is a credit watch, single-notch or multiple-notch rating change. If there are multiple announcements by different rating agencies for the same firm in any two-week window, we only consider the first announcement as conveying new information and exclude the subsequent announcements. The sample contains 33 positive and 38 negative credit events.

Results

We divide our sample into three periods — a pre-crisis period and the two separate crisis periods. The pre-crisis period is characterised by low and stable credit spreads. It coincides with increasing liquidity in the CDS market, historically low interest rates and corporate default rates, low equity market volatility and increasing equity values. We select 31 July 2007 as the start of the first crisis period (Crisis I) because of heavy losses reported by hedge funds stemming from sharp reductions in the value of collateralised debt obligations based on sub-prime mortgages. The start of the period corresponds to the peak in both equity markets and interest rates. The average level of CDS spreads increased from 29 bps to 92 bps between the pre-crisis period and Crisis I, while the average weekly change increased from 0.08 bps to 1.79 bps. The second crisis (Crisis II) period covers the banking crisis triggered by the failure of Lehman Brothers on 15 September 2008. During Crisis II the CDS spreads rose to an average of 160 bps. The summary statistics for the variables across the three sub-samples are provided in Table 1 with time series behaviour of the CDS spread mean, median and range depicted in Figure 1.

CDS spread levels

The CDS spread level regression results using Equation 1 are summarised in Table 2. In the pre-crisis period, higher leverage and lower credit ratings have a significant effect on the differences in the level of CDS spreads across firms although leverage is not an important explanatory variable for financial firms.
TABLE 1: Descriptive statistics: crisis analysis

<table>
<thead>
<tr>
<th></th>
<th>Pre-Crisis</th>
<th>Crisis I</th>
<th>Crisis II</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Std Dev</td>
<td>Mean</td>
</tr>
<tr>
<td><strong>Panel A: Levels</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CDS</td>
<td>28.505</td>
<td>24.087</td>
<td>91.766</td>
</tr>
<tr>
<td>Target</td>
<td>0.915</td>
<td>10.178</td>
<td>10.699</td>
</tr>
<tr>
<td>StDTarget</td>
<td>8.911</td>
<td>5.144</td>
<td>10.171</td>
</tr>
<tr>
<td>Leverage</td>
<td>1.948</td>
<td>2.443</td>
<td>2.536</td>
</tr>
<tr>
<td>5ySwap</td>
<td>6.304</td>
<td>0.343</td>
<td>7.272</td>
</tr>
<tr>
<td><strong>Panel B: Changes</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ΔCDS</td>
<td>0.079</td>
<td>5.888</td>
<td>1.785</td>
</tr>
<tr>
<td>ΔTarget</td>
<td>0.312</td>
<td>1.675</td>
<td>-0.332</td>
</tr>
<tr>
<td>ΔStDTarget</td>
<td>0.002</td>
<td>1.255</td>
<td>0.046</td>
</tr>
<tr>
<td>ΔStock Return</td>
<td>0.272</td>
<td>2.796</td>
<td>-0.365</td>
</tr>
<tr>
<td>Δ5ySwap</td>
<td>0.016</td>
<td>0.075</td>
<td>-0.009</td>
</tr>
<tr>
<td>ΔStock Vol</td>
<td>0.025</td>
<td>2.527</td>
<td>0.326</td>
</tr>
</tbody>
</table>

This table contains descriptive statistics for a sample of 22 single-name five-year Australian CDS contracts and their hypothesised determinants from 3 Jan 2006 to 31 Dec 2010, measured at a weekly frequency. CDS is the credit default swap spread, Target is the median equity analyst target price divided by its current stock price, StDTarget is the cross-sectional standard deviation of equity analyst price targets, Leverage is the value of firm liabilities as a percent market capitalisation, 5ySwap is the five-year swap rate, Stock Vol is the 30-day put option-implied volatility. ΔCDS is the change in the credit default swap spread, ΔTarget is the percentage change in the median equity analyst target price, ΔStDTarget is the change in the cross-sectional standard deviation of equity analyst price targets, Stock Return is return on each individual stock, Δ5ySwap is the change in the five-year swap rate and ΔStock Vol is the change in the 30-day put option-implied volatility.

FIGURE 1: Credit default swap spreads: 2006 to 2010

This figure presents the evolution of CDS spreads from 3 Jan 2006 to 31 Dec 2010. The summary statistics are based on the daily cross-section of CDS spreads over 22 single-name five-year Australian CDS contracts. Pre-crisis covers a period from 3 Jan 2006 until 31 July 2007, Crisis I is from 1 August 2007 until 15 September 2008 and Crisis II is from 16 September 2008 until 31 December 2010.
The coefficients on the credit rating dummies indicate that firms rated A and BBB command a statistically significant credit risk premium of 13 bps and 26 bps, respectively, relative to the AA-rated firms. The results also suggest that analysts and equity volatility do not affect CDS spreads during this benign market environment. The model can explain 42 per cent of the variation in CDS spreads.

During Crisis I, CDS spreads become more sensitive to equity market fluctuations and option-implied equity volatility becomes highly statistically significant. Economically, one standard deviation increase in volatility translates to a 29 bps increase in spread. Leverage continues to be an important determinant of CDS spreads for non-financial firms in Crisis I. The Target variable (analysts’ target price/current price), which can be interpreted as a one-year-ahead expected return is also significant, however, contrary to expectations it is positively related to spreads. This observed relationship is misleading and can be explained by the disparity between the speeds at which information is reflected in the target prices. Lags in revising analyst targets in a period of falling equity prices and increasing CDS prices due to the leverage create the illusion of a higher expected return. Interestingly, the credit rating coefficients are not significant and close to zero, indicating that ratings are unable to differentiate the credit risks implied by the CDS market. Overall, our model can explain 62 per cent of the variation of CDS spread levels during Crisis I.

In Crisis II, following the collapse of Lehman Brothers, analyst target price dispersion becomes a statistically significant determinant of spreads. Equity volatility remains a key driver and its effect actually trebles. One standard deviation increase in dispersion increases spreads by 28 bps while one standard deviation increase in volatility increases spreads by 85 bps. The swap rate, our proxy for the risk-free rate, also has a significant effect on CDS spreads, largely due to the declining short-term interest rates over this period. Leveraged has the expected sign but it is no longer statistically significant. The Target variable is still positive but also not statistically significant. The explanatory power of the model remains high, with an adjusted $R^2$ of over 60 per cent.

Comparing the two crisis periods to the pre-crisis period, it is apparent that forward-looking market factors and proxies for valuation uncertainty have a stronger effect during times of heightened credit risk, with non-market related backward-looking variables, such as leverage, and credit ratings being more important in explaining spread variations in calm, orderly credit markets.

### Table 2: Determinants of CDS spread levels: crisis analysis

<table>
<thead>
<tr>
<th>Variable</th>
<th>Pre-Crisis</th>
<th>Crisis I</th>
<th>Crisis II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>11.631</td>
<td>-96.855</td>
<td>132.758*</td>
</tr>
<tr>
<td>Target</td>
<td>-6.696</td>
<td>164.942***</td>
<td>75.128</td>
</tr>
<tr>
<td>Std Target</td>
<td>-0.596</td>
<td>1.406</td>
<td>3.942**</td>
</tr>
<tr>
<td>Leverage</td>
<td>23.469***</td>
<td>44.822**</td>
<td>41.288</td>
</tr>
<tr>
<td>Leverage x Fin dum</td>
<td>-23.858***</td>
<td>-46.327**</td>
<td>-43.055</td>
</tr>
<tr>
<td>5-year Swap Rate</td>
<td>1.592</td>
<td>7.218</td>
<td>-39.357***</td>
</tr>
<tr>
<td>Stock Vol</td>
<td>-0.477</td>
<td>2.710***</td>
<td>4.991***</td>
</tr>
<tr>
<td>Dummy A</td>
<td>13.308***</td>
<td>-0.352</td>
<td>25.092</td>
</tr>
<tr>
<td>Dummy BBB</td>
<td>25.826***</td>
<td>-7.341</td>
<td>-22.690</td>
</tr>
<tr>
<td>Obs.</td>
<td>1804</td>
<td>1298</td>
<td>2640</td>
</tr>
<tr>
<td>Adj. $R^2$</td>
<td>0.423</td>
<td>0.624</td>
<td>0.607</td>
</tr>
</tbody>
</table>

Equation 1 regression results across three sub-periods. Absolute value of t-statistics based on firm- and week-clustered standard errors are shown in parentheses. *, ** and *** indicate significance at 10%, 5% and 1%, respectively.

CDS spread changes

The results of the first difference regressions (Equation 2) are displayed in Table 3. In all periods the constant in the regression is not significantly different from zero. In the benign pre-crisis economic environment credit spreads are only significantly affected by positive credit announcements. The spreads are characterised by a lack of volatility, producing a low explanatory power with an adjusted $R^2$ of less than 5 per cent. Although a positive correlation between changes in CDS spreads and equity returns seems counterintuitive, increasing leverage can boost profitability and raise the return on equity during periods of low financial distress. Consistent with the preceding section, market-based variables become increasingly prominent in the pricing of CDS spreads from the onset of Crisis I. During both crisis periods, equity returns and equity volatility become statistically significant in explaining CDS spread changes. Once the volatility in the market rises, increases in analyst dispersion cause
CDS spreads to widen. This statistically significant result clearly supports our hypothesis that increases in uncertainty in equity analysts’ forecasts are associated with higher credit risk. Negative credit rating news also becomes significant with negative news triggering an increase in CDS spread of 6 bps. We conclude that while CDS spreads respond to credit rating events, credit ratings are not as effective in classifying market-implied credit risk during market turmoil. During Crisis I our model explains almost 14 per cent of the variation in CDS spread changes.

During Crisis II the impact of most of the market-based determinants on the CDS spreads intensifies. Changes in stock volatility, the five-year swap rate, equity analyst uncertainty, target price changes and credit events all become significantly correlated with spread changes, with the hypothesised signs. Together, these factors can explain over 16 per cent of the variation in CDS spread changes of the 22 firms in the sample.

**TABLE 3: Determinants of changes in CDS spreads: crisis analysis**

<table>
<thead>
<tr>
<th></th>
<th>Pre-crisis</th>
<th>Crisis I</th>
<th>Crisis II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>-0.125</td>
<td>1.438</td>
<td>-0.386</td>
</tr>
<tr>
<td>(0.31)</td>
<td>(1.38)</td>
<td>(0.33)</td>
<td></td>
</tr>
<tr>
<td>ΔTarget</td>
<td>0.470</td>
<td>-0.127</td>
<td>-0.744**</td>
</tr>
<tr>
<td>(1.13)</td>
<td>(0.45)</td>
<td>(2.05)</td>
<td></td>
</tr>
<tr>
<td>ΔStD Target</td>
<td>-0.820</td>
<td>0.645**</td>
<td>0.570*</td>
</tr>
<tr>
<td>(1.27)</td>
<td>(2.52)</td>
<td>(1.83)</td>
<td></td>
</tr>
<tr>
<td>Stock Return</td>
<td>0.080</td>
<td>-0.747***</td>
<td>-1.290***</td>
</tr>
<tr>
<td>(0.85)</td>
<td>(4.01)</td>
<td>(3.88)</td>
<td></td>
</tr>
<tr>
<td>Δ5ySwap</td>
<td>1.321</td>
<td>3.415</td>
<td>-44.479***</td>
</tr>
<tr>
<td>(0.48)</td>
<td>(0.36)</td>
<td>(3.20)</td>
<td></td>
</tr>
<tr>
<td>ΔStock Vol</td>
<td>-0.177</td>
<td>0.344**</td>
<td>0.671**</td>
</tr>
<tr>
<td>(1.33)</td>
<td>(2.28)</td>
<td>(2.27)</td>
<td></td>
</tr>
<tr>
<td>Credit[-]</td>
<td>5.600</td>
<td>6.356**</td>
<td>18.940***</td>
</tr>
<tr>
<td>(1.46)</td>
<td>(2.03)</td>
<td>(2.93)</td>
<td></td>
</tr>
<tr>
<td>Credit[+]</td>
<td>-1.517***</td>
<td>-2.302</td>
<td>-28.808*</td>
</tr>
<tr>
<td>(3.44)</td>
<td>(0.44)</td>
<td>(1.92)</td>
<td></td>
</tr>
<tr>
<td>Obs</td>
<td>1804</td>
<td>1298</td>
<td>2640</td>
</tr>
</tbody>
</table>

Equation 2 regression results across three sub-periods. Absolute value of t-statistics based on firm- and week-clustered standard errors are shown in parentheses. * , ** and *** indicate significance at 10%, 5% and 1%, respectively.

**Conclusion**

This study investigates the key drivers of Australian corporate CDS spreads during the financial crisis at a weekly frequency. In addition to examining credit ratings, firm-specific and market-level variables, we include equity analysts’ consensus forecasts and their cross-sectional standard deviation as a proxy for uncertainty. We separate the sample into three sub-periods to assess the relative importance of these factors during the financial crisis. The results show that equity analyst price target forecasts offer increased explanatory power in pricing credit spread levels and changes, with higher uncertainty leading to higher spreads. We find that our variables explain up to 63 per cent of the variation in CDS spreads and 17 per cent of the variation in CDS spread changes. Leverage and credit ratings convey significantly more information about credit risk during benign market periods than market-based variables. Conversely, we find that the explanatory power of credit ratings decreases during the financial crisis.

During volatile periods, market-linked variables, such as equity returns, interest rates, volatility and analyst information are more prominent in explaining CDS spreads. The results indicate that traders of credit instruments should be aware that in times of heightened credit risk, equity market-based factors play a more pivotal role in determining CDS spreads.

**Notes**

1. Panel and individual firm unit root tests show that the CDS spread levels are stationary at the 1 per cent level.
2. The 22 companies included in our sample are Amcor, AMP, ANZ Bank, BHP Billiton, Coca-Cola Amatil, Commonwealth Bank of Australia, CSR, Fosters, General Property Trust, Lend Lease, Macquarie Bank, National Australia Bank, QBE Insurance, Qantas, Rio Tinto, Tabcorp, Telstra, Wesfarmers, Westfield, Westpac, Woodside and Woolworths.
3. Clustered standard errors are utilised to adjust for correlation across firms and time. We omit results using fixed effects as they do not alter the results.

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Melgarejo, M.A. 2010, ‘Beating market expectations, analysts’ forecast dispersion and the pricing of credit default swaps’, working paper, Purdue University.
DO RATIONAL SPECULATIVE BUBBLES EXIST in the Australian stock market?

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Using McQueen and Thorley’s (1994) duration dependence technique, we examine whether the Australian share market was characterised by rational speculative bubbles over the period 1985 to 2012. Our analysis of both monthly and weekly returns shows no evidence of rational speculative bubbles over the sample period. This suggests that the long run-up in stock prices and the subsequent drop in the mid-1980s and in the months prior to the global financial crisis of 2008 may have been due to either fundamental value changes or irrational investor behaviour.

From a level around 860 early in 1985, the ASX All Ordinaries Index almost tripled in value to 2249 by early 1987 before abruptly collapsing to 1294 at the end of the same year. More recently, the index climbed from just under 3000 in early 2003 to a peak of 6772 in late 2007 before suddenly falling to 3296 in early 2009. Episodes such as these seem to point to the presence of speculative bubbles in the Australian stock market. This is an important issue because of its apparent connections with the efficient allocation of investment resources and asset pricing.

Bubbles are empirically characterised by a long run-up in price followed by a crash. During a bubble episode actual stock prices diverge from their fundamental values, and this divergence is often attributed by the popular press to irrational investor behaviour and evidence of inefficient markets. A rational speculative bubble is a special case since it can exist without assuming irrational investors. In a rational bubble, even though investors realise a bubble exists, they will find it rational to stay in the market if the growth rate of the bubble ensures that probable future returns exactly compensate them for the possibility of a crash. Given anecdotal evidence of bubble episodes in the Australian equity market, we formally test for the presence of rational speculative bubbles over the period from June 1985 to June 2012. This sample period encapsulates volatility-inducing events such as economic liberalisation, the dot.com bubble, 11 September 2001 and the recent US sub-prime mortgage crisis.

A common test for the presence of bubbles involves an examination of the long-run relationship between stock prices and fundamental variables such as dividends or earnings using cointegration analysis. The absence of a long-run relationship between stock prices and fundamental variables points to the presence of bubbles. However, a major weakness of the cointegration test is that it is a joint test for the presence of bubbles and the correct identification of fundamental variables that are related to stock price.

Another category of bubble tests relies on an examination of stock returns for empirical attributes of bubbles such as autocorrelation, skewness and kurtosis. These attributes necessarily derive from the two characteristics of bubbles: extended runs of positive returns (positive autocorrelation); and the eventual crash. The long run of positive returns and the singular or few large negative returns characterising the crash mean that the bubble process must be skewed, although leptokurtosis (fat-tailed distributions) implies that price changes occasionally deviate by large amounts consistent with a crash. However, autocorrelation, skewness and kurtosis are not unique to bubbles as autocorrelation could also be induced by time-varying risk premiums (Fama and French 1988) and fads (Poterba and Summers 1988), while skewness could be due to asymmetric fundamental news and leptokurtosis could be caused by batched arrival of information (Tauchen and Pitts 1983).

This study employs the duration dependence test developed by McQueen and Thorley (1994) who show that rational speculative bubbles are characterised by runs of positive returns whose conditional probability of ending is a decreasing function of the duration or length of the run (i.e. negative duration dependence). In other words, the longer is the sequence of positive
returns, the smaller is the probability that the run will end. This comes about from the rational bubble process which models unexpected price changes as coming from two sources: changes in fundamental value, and changes in the bubble. As the bubble component grows, it dominates the fundamental component, which means that negative shocks to fundamental value will have minimal impact on total returns. Hence, the bubble continues to grow until it eventually crashes. McQueen and Thorley (1994) show that negative duration dependence is a unique characteristic of rational speculative bubbles. Unlike cointegration tests, the duration dependence test does not require a specification of the underlying fundamental value relationship model. Another advantage of the test is that it does not require the time series behaviour under investigation to be normally distributed.

Despite speculation about the existence of bubbles in the Australian share market, the empirical evidence is mixed among the few extant studies. Sarno and Taylor (1999) use cointegration tests to examine East Asian markets and the Australian market for bubbles. They find no evidence of a bubble in the Australian share market, noting that there does not appear to be a boom/bust tendency or trend in returns over the period from 1988 to 1997. In sharp contrast, Ahmed et al. (1998) find significant evidence that Australian share price movements deviate excessively from their fundamental values using a regime switching model. They find that the Australian share market was subject to a speculative bubble over the period from 1986 to 1996. Similarly, Black et al. (2003) observe, using a restricted vector-autoregressive model, that Australian share prices deviate substantially and significantly from their fundamental values for long periods of time (about four years). However, no systematic study has applied McQueen and Thorley’s (1994) duration dependence test to examine whether such deviations from fundamental value could be due to rational speculative bubbles.

**Data and methods**

We use monthly and weekly closing prices of the Australian Securities Exchange All Ordinaries Price Index (ASX 200) collected from DataStream to test for the presence of rational speculative bubbles over a 27-year period, from June 1985 to June 2012. McQueen and Thorley (1994) suggest that it may be more appropriate to use monthly rather than weekly returns in duration dependence tests because the latter could contain more noise, making the detection of bubbles difficult. However, the relatively short data series provided by monthly data could result in a lack of power for monthly tests. Hence, we use both monthly and weekly index values.

Duration dependence tests for rational bubbles are first conducted using real returns. Continuously compounded monthly (weekly) returns are converted to real returns by subtracting the continuously compounded monthly (weekly) inflation rate. Since Australia is one of a few countries which still reports quarterly instead of monthly Consumer Price Index (CPI) data, we divide the quarterly inflation rate by three (13) to give the monthly (weekly) inflation rate. As robustness tests, we also conduct duration dependence tests on monthly and weekly excess returns defined relative to the sample mean, following Chan et al. (1998). In addition, we follow Chan et al. (1998) and perform duration dependence tests on the residuals from an AR(4) model of monthly and weekly returns.

To apply the duration dependence tests, the returns of the ASX All Ordinaries Index are first transformed into run lengths of positive and negative observed returns. The numbers of positive or negative runs of particular length, \( i \), are then counted. For example, if we have a return series consisting of two positive returns followed by four negative, three positive and five negative returns, this data set is transformed into runs of positive returns with values of 2 and 3 and runs of negative returns with values of 4 and 5. The probability of ending a run or the sample hazard rate for each length \( i \) can then be computed as \( h_i = N_i / (M_i + N_i) \) where \( N_i \) is the number of completed runs of the length \( i \) in the sample, and \( M_i \) is the number of completed runs with length greater than \( i \). We can then examine the relationship between the probability of the run ending (\( h_i \)) and length of the run \( i \). A negative relationship between the probability that a run of positive returns ends and the length of the runs indicates the presence of rational speculative bubbles. There can be no bubbles in runs of negative returns because this would imply that stock prices can be negative as the bubble grows over time. Hence, there should be no relationship between the length of the run and the probability of the run of negative returns ending.

To formally test for these relationships, we first specify a functional form for the probability of ending a run (\( h_i \)). This is referred to as the hazard function. We employ the log-logistic hazard function. We estimate the slope parameter or beta coefficient (\( \beta \)) of the hazard function and test the null hypothesis of no bubble. Under the null hypothesis of no bubble the beta coefficient should equal zero. The alternative hypothesis is for the beta coefficient to be negative, which suggests that the probability of a positive run ending is a decreasing function of the length of the run (i.e. negative duration dependence).

**Empirical results**

**Descriptive statistics**

Figure 1 provides a time series plot of the ASX All Ordinaries Index. The plot shows a generally increasing
Duration dependence test results
Table 2 reports the run counts, hazard rates and the results of the duration dependence test on positive and negative runs of monthly returns. The results for real returns reported in Panel A show that out of 325 monthly returns over the sample period, 67 were followed by a return of the opposite sign (i.e. runs of 1) while 41 were followed by a return of the same sign (i.e. runs of 2). Panel A also shows that the longest run of positive returns lasted for 11 months. This run ended in June 2007. There are also two positive return runs lasting for 10 months. One 10-month run ended in May 1987 and the other ended in February 2005. The negative runs are much shorter in length with the longest negative run lasting just seven months. Assuming that monthly returns are independent, the probability of getting 10 consecutive positive runs is approximately 0.10 per cent (1 in one thousand), while the probability of getting 11 consecutive runs is 0.05 per cent (1 in two thousand). The fact that we have one (two) run(s) of 11 (10) consecutive positive returns out of 325 observations seem to indicate the presence of bubbles. The question is: are they rational bubbles?

An analysis of the patterns, if any, in the probability of ending a run (which are reported as sample hazard rates in Panel A) relative to the length of the run will give an indication of the presence or absence of rational bubbles. However, a close inspection of the sample hazard rates does not reveal any discernible patterns. For example, for run lengths of one to five, the hazard rates are 0.356, 0.574, 0.250, 0.400 and 0.333, respectively. This result suggests that the market was not characterised by rational speculative bubbles over the sample period.

For a more formal test of the pattern in the hazard rates we examine the beta parameters of the hazard function. The bottom part of Panel A in Table 2 shows that for positive runs, the beta coefficient of the hazard function is negative at -0.102, but it is statistically insignificant ($p$-value of 0.633). The beta coefficient for negative runs is also insignificant as expected. Therefore, based on evidence from real monthly returns, we conclude that there were no rational speculative bubbles over the sample period.

Trend in prices over the sample period. However, the plot also exhibits episodes of price run-ups followed by sharp declines including the widely acknowledged financial market boom and crash encompassing the 1985 to 1987 period. At a more significant level, the most recent financial market boom and crash resulting from the US sub-prime mortgage crisis can be seen over the period 2003 to 2007.

To provide a general understanding of the nature of the overall Australian share market, Table 1 reports the descriptive statistics of the monthly and weekly returns for the ASX All Ordinaries Index. Table 1 shows a mean monthly (weekly) return of 0.48 (0.11) per cent over the sample period. Table 1 further reports that monthly and weekly returns are not normally distributed given the large Jarque-Bera statistics. In fact, the monthly and weekly returns are negatively skewed and exhibit excess kurtosis, indicative of the potential presence of bubbles. The $Q_{12}$ statistic for autocorrelation indicates that while the monthly returns do not exhibit serial correlation, the weekly returns are positively autocorrelated, which indicates the presence of bubbles for the latter. However, as discussed earlier, these descriptive statistics, although indicative of the presence of bubbles, may also be driven by factors that are unrelated to bubbles. Hence, we now present results of the duration dependence tests.

Table 1: Summary statistics of monthly and weekly returns of the ASX All Ordinaries Index

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean return (%)</th>
<th>Std Dev.</th>
<th>Min (%)</th>
<th>Max (%)</th>
<th>Skewness</th>
<th>Kurtosis</th>
<th>Jarque-Bera</th>
<th>$Q_{12}$ statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monthly returns</td>
<td>325</td>
<td>0.478</td>
<td>5.18</td>
<td>-55.2</td>
<td>13.6</td>
<td>-4.00 (0.136)</td>
<td>43.1 (0.272)</td>
<td>22644</td>
<td>5.723 (0.921)</td>
</tr>
<tr>
<td>Weekly returns</td>
<td>1413</td>
<td>0.109</td>
<td>2.26</td>
<td>-276</td>
<td>7.38</td>
<td>-2.44 (0.065)</td>
<td>28.1 (0.130)</td>
<td>40964</td>
<td>37.685 (0.000)</td>
</tr>
</tbody>
</table>

Note: Numbers in parentheses below the skewness and excess kurtosis coefficients are asymptotic standard errors, $(6/T)^{1/2}$ and $(24/T)^{1/2}$, respectively. The $Q_{12}$ statistic is the Ljung-Box test for autocorrelation at the 12th lag, and the numbers in parentheses are the $p$-values.
### TABLE 2: Run counts, hazard rates and tests of duration dependence for runs of monthly returns, June 1985 to June 2012

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Run Length</td>
<td>Actual Run Counts</td>
<td>Sample Hazard Rates</td>
</tr>
<tr>
<td>1</td>
<td>26</td>
<td>0.356</td>
</tr>
<tr>
<td>2</td>
<td>27</td>
<td>0.574</td>
</tr>
<tr>
<td>3</td>
<td>5</td>
<td>0.250</td>
</tr>
<tr>
<td>4</td>
<td>6</td>
<td>0.400</td>
</tr>
<tr>
<td>5</td>
<td>1</td>
<td>0.167</td>
</tr>
<tr>
<td>6</td>
<td>1</td>
<td>0.000</td>
</tr>
<tr>
<td>7</td>
<td>1</td>
<td>0.000</td>
</tr>
<tr>
<td>8</td>
<td>0</td>
<td>0.000</td>
</tr>
<tr>
<td>9</td>
<td>0</td>
<td>0.000</td>
</tr>
<tr>
<td>10</td>
<td>2</td>
<td>0.667</td>
</tr>
<tr>
<td>11</td>
<td>1</td>
<td>1.000</td>
</tr>
<tr>
<td>12</td>
<td>13</td>
<td>0.000</td>
</tr>
<tr>
<td>Total</td>
<td>73</td>
<td>74</td>
</tr>
</tbody>
</table>

### Log-logistic hazard function

- **\( \alpha \)**: parameter of the hazard function
- **\( \beta \)**: rate parameter
- **LRT of H1: \( \beta = 0 \)**: likelihood ratio test statistic of the null hypothesis of no duration dependence or constant hazard rate

<table>
<thead>
<tr>
<th></th>
<th>Panel A</th>
<th>Panel B</th>
<th>Panel C</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Run Length</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>0.355</td>
<td>0.138</td>
<td>0.326</td>
</tr>
<tr>
<td>2</td>
<td>0.102</td>
<td>0.051</td>
<td>0.142</td>
</tr>
<tr>
<td>3</td>
<td>0.226</td>
<td>0.028</td>
<td>0.334</td>
</tr>
<tr>
<td>4</td>
<td>0.633</td>
<td>0.867</td>
<td>0.562</td>
</tr>
</tbody>
</table>

**Note:** The duration dependence test is performed on monthly real returns, excess returns and AR(4) residuals. Monthly real returns are nominal returns minus the one-month Australian inflation rates. Excess returns are nominal returns minus the in-sample mean. AR(4) residuals are from an autoregressive model with 4 lags. Total runs are numbers of total positive and negative runs. The sample hazard rate \( \hat{h}_i = \frac{N_i}{M_i-N_i} \) is the probability that a run ends at length \( i \) provided that it lasts until \( i \), where \( N_i \) is the number of completed runs of the length \( i \) in the sample, and \( M_i \) the number of completed runs with length greater than \( i \). \( \beta \) is the slope parameter of the hazard function. LRT which is the likelihood ratio test statistic of the null hypothesis of no duration dependence or constant hazard rate (H0: \( \beta = 0 \)) is asymptotically distributed \( \chi^2 \) with one degree of freedom. p-value is the probability of obtaining the calculated value of LRT or higher under the null hypothesis.
### Table 3: Run counts, hazard rates and tests of duration dependence for runs of weekly returns, June 1985 to June 2012

#### Panel A. Real Monthly Returns

<table>
<thead>
<tr>
<th>Run Length</th>
<th>Actual Run Counts</th>
<th>Sample Hazard Rates</th>
<th>Actual Run Counts</th>
<th>Sample Hazard Rates</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>156</td>
<td>0.467</td>
<td>173</td>
<td>0.516</td>
</tr>
<tr>
<td>2</td>
<td>75</td>
<td>0.421</td>
<td>89</td>
<td>0.549</td>
</tr>
<tr>
<td>3</td>
<td>46</td>
<td>0.447</td>
<td>36</td>
<td>0.493</td>
</tr>
<tr>
<td>4</td>
<td>21</td>
<td>0.368</td>
<td>21</td>
<td>0.568</td>
</tr>
<tr>
<td>5</td>
<td>11</td>
<td>0.306</td>
<td>7</td>
<td>0.438</td>
</tr>
<tr>
<td>6</td>
<td>10</td>
<td>0.400</td>
<td>4</td>
<td>0.444</td>
</tr>
<tr>
<td>7</td>
<td>6</td>
<td>0.400</td>
<td>0</td>
<td>0.000</td>
</tr>
<tr>
<td>8</td>
<td>5</td>
<td>0.556</td>
<td>2</td>
<td>0.400</td>
</tr>
<tr>
<td>9</td>
<td>1</td>
<td>0.250</td>
<td>3</td>
<td>1.000</td>
</tr>
<tr>
<td>10</td>
<td>1</td>
<td>0.333</td>
<td>1</td>
<td>0.500</td>
</tr>
<tr>
<td>11</td>
<td>1</td>
<td>0.500</td>
<td>0</td>
<td>0.000</td>
</tr>
<tr>
<td>12</td>
<td>0</td>
<td>0.000</td>
<td>0</td>
<td>0.000</td>
</tr>
<tr>
<td>13</td>
<td>1</td>
<td>1.000</td>
<td>1</td>
<td>1.000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>334</td>
<td>335</td>
<td></td>
<td></td>
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#### Panel B. Nominal Monthly Excess Returns

<table>
<thead>
<tr>
<th>Run Length</th>
<th>Actual Run Counts</th>
<th>Sample Hazard Rates</th>
<th>Actual Run Counts</th>
<th>Sample Hazard Rates</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>163</td>
<td>0.477</td>
<td>177</td>
<td>0.516</td>
</tr>
<tr>
<td>2</td>
<td>78</td>
<td>0.436</td>
<td>91</td>
<td>0.548</td>
</tr>
<tr>
<td>3</td>
<td>46</td>
<td>0.455</td>
<td>36</td>
<td>0.480</td>
</tr>
<tr>
<td>4</td>
<td>22</td>
<td>0.400</td>
<td>22</td>
<td>0.564</td>
</tr>
<tr>
<td>5</td>
<td>12</td>
<td>0.364</td>
<td>8</td>
<td>0.471</td>
</tr>
<tr>
<td>6</td>
<td>11</td>
<td>0.524</td>
<td>4</td>
<td>0.444</td>
</tr>
<tr>
<td>7</td>
<td>5</td>
<td>0.500</td>
<td>1</td>
<td>0.200</td>
</tr>
<tr>
<td>8</td>
<td>3</td>
<td>0.600</td>
<td>2</td>
<td>0.500</td>
</tr>
<tr>
<td>9</td>
<td>0</td>
<td>0.000</td>
<td>2</td>
<td>1.000</td>
</tr>
<tr>
<td>10</td>
<td>1</td>
<td>0.333</td>
<td>1</td>
<td>0.500</td>
</tr>
<tr>
<td>11</td>
<td>0</td>
<td>0.000</td>
<td>0</td>
<td>0.000</td>
</tr>
<tr>
<td>12</td>
<td>1</td>
<td>1.000</td>
<td>1</td>
<td>1.000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>342</td>
<td>343</td>
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#### Panel C. AR(4) Residuals

<table>
<thead>
<tr>
<th>Run Length</th>
<th>Actual Run Counts</th>
<th>Sample Hazard Rates</th>
<th>Actual Run Counts</th>
<th>Sample Hazard Rates</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>181</td>
<td>0.493</td>
<td>206</td>
<td>0.561</td>
</tr>
<tr>
<td>2</td>
<td>84</td>
<td>0.452</td>
<td>92</td>
<td>0.571</td>
</tr>
<tr>
<td>3</td>
<td>51</td>
<td>0.500</td>
<td>39</td>
<td>0.565</td>
</tr>
<tr>
<td>4</td>
<td>25</td>
<td>0.490</td>
<td>20</td>
<td>0.667</td>
</tr>
<tr>
<td>5</td>
<td>7</td>
<td>0.269</td>
<td>6</td>
<td>0.600</td>
</tr>
<tr>
<td>6</td>
<td>11</td>
<td>0.579</td>
<td>2</td>
<td>0.500</td>
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<td>7</td>
<td>5</td>
<td>0.625</td>
<td>0</td>
<td>0.000</td>
</tr>
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<td>8</td>
<td>2</td>
<td>0.667</td>
<td>1</td>
<td>0.500</td>
</tr>
<tr>
<td>9</td>
<td>1</td>
<td>1.000</td>
<td>1</td>
<td>1.000</td>
</tr>
<tr>
<td>10</td>
<td>1</td>
<td>0.500</td>
<td>1</td>
<td>0.500</td>
</tr>
<tr>
<td>11</td>
<td>0</td>
<td>0.000</td>
<td>0</td>
<td>0.000</td>
</tr>
<tr>
<td>12</td>
<td>1</td>
<td>1.000</td>
<td>1</td>
<td>1.000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>367</td>
<td>367</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Log-logistic hazard function**

<table>
<thead>
<tr>
<th>Panel</th>
<th>$\alpha$</th>
<th>$\beta$</th>
<th>$LRT$ of $H_0: \beta = 0$</th>
<th>$p$-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>-0.144</td>
<td>-0.185</td>
<td>2.78</td>
<td>0.176</td>
</tr>
<tr>
<td></td>
<td>0.105</td>
<td>-0.058</td>
<td>0.095</td>
<td>0.672</td>
</tr>
<tr>
<td>B</td>
<td>-0.113</td>
<td>-0.117</td>
<td>1.01</td>
<td>0.051</td>
</tr>
<tr>
<td></td>
<td>0.093</td>
<td>-0.31</td>
<td>0.312</td>
<td>0.820</td>
</tr>
<tr>
<td>C</td>
<td>-0.054</td>
<td>-0.40</td>
<td>0.109</td>
<td>0.176</td>
</tr>
<tr>
<td></td>
<td>0.247</td>
<td>0.064</td>
<td>0.740</td>
<td>0.674</td>
</tr>
</tbody>
</table>

**Note**: The duration dependence test is performed on monthly real returns, excess returns and AR(4) residuals. Monthly real returns are nominal returns minus the one-month Australian inflation rates. Excess returns are nominal returns minus the in-sample mean. AR(4) residuals are from an autoregressive model with 4 lags. Total runs are numbers of total positive and negative runs. The sample hazard rate $h_i = N_i / (M_i + N_i)$, is the probability that a run ends at length $i$ provided that it lasts until $i$, where $N_i$ is the number of completed runs of the length $i$ in the sample, and $M_i$ the number of completed runs with length greater than $i$. $\beta$ is the slope parameter of the hazard function. LRT which is the likelihood ratio test statistic of the null hypothesis of no duration dependence or constant hazard rate ($H_0: \beta=0$) is asymptotically distributed $\chi^2$ with one degree of freedom. $p$-value is the probability of obtaining the calculated value of LRT or higher under the null hypothesis.
As robustness tests, we perform the same analysis on nominal monthly excess returns and AR(4) residuals and report the results in Panels B and C in Table 2. The results are similar to those in Panel A with the longest positive run lasting for 10 and 11 months for nominal monthly excess returns and AR(4) residuals, respectively. But, more importantly, the respective beta coefficients of the hazard function are not significantly different from zero, indicating the absence of rational speculative bubbles, consistent with the results using monthly real returns.

Next, in Table 3 we report the run counts, hazard rates and results of the duration dependence tests on positive and negative runs of weekly returns. Panel A reports the results for real returns and shows that out of 1413 weekly returns over the sample period, 329 were followed by a return of the opposite sign (i.e. runs of 1) while 164 were followed by a return of the same sign (i.e. runs of 2). Panel A also shows that the longest run of positive returns lasted for 13 weeks, a run that ended in the first week of June 1997. There is also one run lasting 11 weeks and another lasting 10 weeks. The 11-week run ended in the first week of September 2003 while the 10-week run ended in the second week of May 2007. Long runs of weekly returns are more difficult to sustain compared with monthly returns since weekly returns contain more noise. Hence it is not surprising to find the longest run of weekly returns lasting over a period equivalent to just a little over three months. Nonetheless, assuming that weekly returns are independent, the probability of getting 13 consecutive positive runs is approximately 0.01 per cent (1 in 10 thousand), while the probability of getting 11 consecutive runs is 0.05 per cent (1 in two thousand). As with the monthly returns, compared with positive runs the negative runs are shorter, with the longest negative run lasting just nine weeks.

It also appears from Panel A that the sample hazard rates for positive runs are decreasing with the length of the run, suggesting the presence of rational speculative bubbles. For example, for run lengths of one to five, the hazard rates are 0.467, 0.421, 0.447, 0.368 and 0.306, respectively. A more formal test of the pattern in the hazard rates using the hazard function appears to confirm the presence of a rational speculative bubble footprint. The bottom part of Table 3 shows a negative beta coefficient of -0.185, that is significantly different from zero, indicating the absence of rational speculative bubbles, consistent with the results using monthly real returns.

On balance, the weight of the evidence from both monthly and weekly returns suggests that the Australian share market was not characterised by rational speculative bubbles during our sample period.

Concluding remarks

Although previous studies have reported evidence of bubbles in the Australian equity market during the 1987 crash, and anecdotal evidence seems to suggest a bubble episode during the period leading up to the global financial crisis (GFC) of 2009, we find at best marginal evidence of the presence of rational speculative bubbles in the Australian stock market over the period from 1985 to 2012. Though a faint bubble footprint appears with real weekly returns, the weight of the remaining evidence indicates the absence of rational bubbles. This finding implies that the long run-up in prices and the subsequent drop seen in the mid-1980s and in the months leading up to the GFC could have been justified by fundamental value changes. They could, however, also have been due to irrational investor behaviour. Clearly, further research in this area is warranted.

Notes

1. See McQueen and Thorley for a detailed mathematical derivation of this testable implication of rational speculative bubbles.

2. Unfortunately, as Chan et al. (1998) note, there is as yet no coherent theory about how bubbles evolve and burst.

3. The use of duration dependence largely follows the description given in the original paper by McQueen and Thorley (1994). See their paper (from p. 386) for a complete description of the methodology.

4. The log-logistic hazard function can be written as \( h_i = \frac{1}{1 + \exp[-(\alpha + \beta t_i)]} \), where \( h_i \) is the hazard rate or probability of ending a run and \( t_i \) is the length of the run and \( \beta \) is the slope parameter.

5. A normal distribution should have a skewness coefficient of zero and kurtosis coefficient of 3.

6. Recall that bubbles cannot exist in negative runs so the beta coefficient must be zero.

References


The issue of sustainable spending rates for retirees has taken on an added dimension since the global financial crisis (GFC) due to the substantial losses that pension funds suffered during the 2007–08 period, and the lacklustre performance of markets and funds in the post-GFC period. The importance of sustainable spending rates is also underscored by the fact that the Australian population is ageing rapidly, and is expected to have an increased life expectancy. The Treasury projects that in 2050 nearly 25 per cent of the population will be aged 65 and over, compared with 13 per cent today.1 Longer post-retirement life spans combined with the possibility of lower retirement savings balances gives increased importance to this issue of sustainable withdrawals. Some commentators suggest that the financial planning industry pays too little attention to the concept of sustainable spending. For example, in an editorial comment titled ‘Sustainable spending in a lower-return world’, Arnott (2004) states that ‘The investment industry pays scant attention to the concept of “sustainable spending”, which is key to effective strategic planning for corporate pensions, public pensions, foundations, and endowments — even for individuals’.

Despite the uncertainties involved in predicting future financial returns, perhaps a sensible approach to retirement financial planning would be to base expectations on the recent past experiences and performance of markets, with some added sensitivity analyses for estimating risk. The financial experiment conducted in this paper follows this approach, with future projections being made by replicating the recent past market performances in a bootstrap simulation framework, for the purposes of formulating sustainable withdrawal rates and estimating risks.

There are several contexts in which it is important to determine the optimal rate of withdrawal from an investment portfolio while ensuring the withdrawal is sustainable over a desired horizon. The most common is the situation faced by a new retiree whose life savings are held in an investment portfolio. The retiree has to make monthly withdrawals from the savings pool for living expenses, while ensuring that the portfolio value is maintained at a level sufficient to support the withdrawal stream for the rest of their life. If the withdrawal rate is too high the retiree faces the prospect of running down the savings pool prematurely, resulting in financial ruin. If the withdrawal rate is too low the retiree is deprived of a better standard of living during their twilight years.

How does the retiree determine the optimal amount to withdraw while maintaining some minimum safety level in the portfolio value if investment returns and remaining life span are uncertain? Regardless of whether the retiree wishes to target a portfolio value of zero at the end of life or some positive value to leave as a bequest (or as an additional safety measure) the same computational issues apply.

These computational issues also arise in other contexts, for example, the situation faced by the trustees of an endowment, such as a scholarship fund. How do the trustees determine the maximum sustainable scholarships that can be offered while maintaining desired safety levels in portfolio value? Financial institutions such as insurance companies face a similar question in pricing annuity products. What risk of ruin is involved in promising a fixed payment stream to the annuitant given projected, but uncertain, investment returns on the sum received over the life of the product?
associated with those outcomes as measured by the probabilities of financial ruin. This approach is compared with a simulation-free analytical approach proposed in Milevsky and Robinson (2005).

Related literature

A computational approach to sustainable withdrawal rate calculations

The situation faced by a new retiree planning their future retirement finances is considered. At the time of retirement their life savings are assumed to be held in an investment portfolio with fixed monthly withdrawals made from the portfolio for living expenses. The retiree’s remaining life span and the returns from the investment portfolio are uncertain. The retiree’s objective is to determine the fixed spending rate that is sustainable over the rest of their life with some minimum level of confidence.

Put another way, the retiree is seeking to determine the probability of facing financial ruin for a given spending rate. Milevsky and Robinson (2005) illustrate how the spending rate, longevity and investment returns are linked with the probability of financial ruin, by means of the retirement finances triangle shown below. Longevity, investment returns and the consumption rate are shown at the nodes of the triangle, each affecting the probability of financial ruin, represented by the mass inside the triangle. An increase in the spending rate, increase in longevity or a reduction in the investment returns will increase the probability of financial ruin.2

![Figure 1: The retirement finances triangle — based on Milevsky and Robinson (2005)](image)

The retiree outlives their resources and faces financial ruin if the present value of the future spending stream exceeds the initial investment pool, \( w \). In the simplistic case where the investment returns and longevity are known with certainty, and if \( T \) is the time of death, and \( R \) is the investment return each period, the present value of a future spending stream of \( \$1 \) each period can be expressed as \( PV \), the present value of an annuity, given as:

\[
PV = \sum_{i=1}^{T} \frac{1}{(1+R)^i}
\]

If \( c \) is the number of dollars the retiree plans to spend each year, financial ruin results if \( c.PV > w \). Since \( PV \), in this case, depends only on \( R \) and \( T \), which are known, whether \( c \) and \( w \) are consistent is easily established.

When the life span of the retiree and the investment returns are both uncertain, the present value of a spending stream of \( \$1 \), referred to as the Stochastic Present Value (SPV) takes the following form:

\[
SPV = \frac{1}{(1+\bar{R})} + \frac{1}{(1+\bar{R})(1+\bar{R})} + \ldots + \frac{1}{\Pi_{j=1}^{T}(1+\bar{R})}
\]

\[
= \sum_{i=1}^{T} \Pi_{j=1}^{i}(1+\bar{R})^i
\]

Here \( \bar{T} \) is the random time of death, \( \bar{R} \) is the random investment return and \( j \) is any period within the life span \( T \). The probability of financial ruin is then equal to the probability that the SPV (multiplied by the planned annual consumption) is greater than the initial savings pool. To compute the probability of retirement ruin the value of the SPV has to be computed.

The value of the SPV is not readily found analytically in this stochastic case. However, Milevsky and Robinson (2005) provide an analytical approach to solving for the SPV by making some simplifying assumptions regarding the probability distributions of the stochastic variables. They derive a closed form solution under the assumption that returns are lognormally distributed and lifetimes are exponentially distributed. They show that the probability of SPV (for a planned consumption stream of \( \$1 \)) being greater than the value of the retirement savings pool \( w \) is given by the Gamma distribution evaluated at the parameters of the distribution, and is shown as follows:3

\[
\text{Prob}(SPV > w) = \text{GammaDist} \left( \frac{(2\mu+4\lambda)}{(\sigma^2+\mu)}, 1, \frac{\sigma^2+\lambda}{2}, 1 \right)
\]

where, \( \mu \) and \( \sigma \) are the return and volatility of the investment portfolio, and \( \lambda \) is the mortality rate. For given values of these parameters, the probability of SPV being larger than \( w \), which is the probability of financial ruin, can be computed on an Excel spreadsheet or with a statistical computer package.

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Data-centric approaches
Using more data-centric approaches, researchers in the financial planning industry have been investigating the issue of estimating a maximum sustainable withdrawal rate that will allow a retirement asset pool to fund a full retirement period. An early study that has significantly influenced industry practice is Bengen (1994). In this study, 65 years of US equity and bond market data between 1926 and 1991 were analysed to search for the highest withdrawal rate that would sustain an equally weighted portfolio of stocks and bonds over a 30-year retirement horizon. Based on his results, Bengen prescribes a 4 per cent withdrawal rate. This rule has come to be known as the ‘4 per cent rule’ and investment advisors in the United States, Australia and other developed markets widely follow the policy of recommending an initial withdrawal rate of 4 per cent to 6 per cent for retirement portfolios. The nominal withdrawal amount is increased each year by the rate of inflation over a retirement horizon, usually assumed as 30 years.

Studies that followed Bengen (1994) have examined many variations on this basic theme. Pye (2000) and others have utilised the bootstrap simulation because it provides a simple framework for mimicking investors who make sustainable withdrawals, and for evaluating investment choices over time without needing to make any further assumptions about risk preferences. Basu, Byrne and Drew (2011) take this approach to examine the accumulation phase of retirement planning, and the benefits or otherwise of asset allocation changes from a pure glidepath that is commonly adopted by life cycle or target date retirement funds. The focus of many of these studies has been on investors and markets based in the United States but the issue of sustainability in retirement planning has received limited attention in Australia.

In this paper, we apply a bootstrap simulation approach to investigate ruin probabilities in retirement portfolios. The methodology of Milevsky and Robinson (2005) is also applied to the Australian context as an alternative approach. The results of this approach form a useful basis for comparing the results of the bootstrap approach.

Data
The data used in the study were sourced from the Thomson Reuters Datastream database. The Datastream-computed benchmark stock market index represents the Australian stock market, and the proxy for the bond market is the Citibank All Maturities Government Bond Index. The data for the bond index commences from December 1984. The stock index commences in 1973 but we select December 1984 as the common start date for both indexes. The sample period ends at February 2012. An advantage in using a sample period that covers the more recent past rather than a long history is that the data is more representative of the recent market experience. This period covers a mix of bull and bear market episodes.

Bootstrap methodology and the simulation approach
Initially, the bootstrap re-sampling technique was used in the field of statistics to examine the probability distribution of sampling outcomes, but it is now widely used in finance for simulation purposes. The historical experience is assumed to reflect some unknown probability distribution, and future projections are derived by randomly re-sampling the data with replacement. This enables the generation of a sufficient number of independent samples needed to generate long series of return paths (which may be longer than the historical data available) and a distribution of end-of-period wealth outcomes. Because the re-sampling is done with replacement, a particular data point from the original dataset can appear multiple times in a given bootstrap sample. The probability distribution of future outcomes reflects the characteristics of the past data.

To compute bootstrap samples, we start with the set of monthly continuously compounded returns observations in the data series and repeatedly draw random observations with replacement until the required number of observations is drawn for a single complete run of wealth path computations. This results in one bootstrap sample. By repeating this process 500 times, we obtain 500 sample runs with randomly selected starting observations for the investment returns. The computational results from the 500 samples provide a frequency distribution of values from which probabilities of outcomes can be computed.

For illustrative purposes, we assume the retiree is 60 years of age at the beginning of their retirement with a savings pool of $100, and plans for a 30-year retirement period, during which 360 monthly withdrawals are made. Wealth paths are simulated for withdrawal rates of 4 per cent, 5 per cent and 6 per cent p.a. on the initial wealth. The investment returns are stated in nominal terms, which incorporate inflation effects. To convert the withdrawals to nominal terms, we raise the monthly withdrawal amount by the monthly inflation rate, based on an annual inflation rate of 3 per cent, the estimate for the future inflation rate in Australia.

We examine three investment scenarios, first an all-equity portfolio wholly invested in the stock index, second an equal-weighted portfolio invested in stocks and bonds, and third a portfolio invested initially in stocks and bonds with equal weights, but with weights progressively shifting entirely to bonds at the end of the 30-year period. This would represent a glidepath that is popular in the funds management
industry for more conservative investors. The probability of survival is defined as the frequency of ending up with a non-negative level of wealth at the end of the retirement horizon in the selected investment strategy. Conversely, the probability of financial ruin is one minus the probability of survival.

The model is calibrated as follows. The value of the investment portfolio at the end of month $t$ is $V_t$. The return of the portfolio for the month is $R_t$ consisting of the capital gains and other cash returns such as dividends, assuming monthly compounding. The withdrawal $W_t$ is assumed to be made at the end of each month. The value of the investment portfolio in the following period $t+1$ is then:

$$V_{t+1} = V_t(1+R_t) - W_t$$

The value of an investment portfolio consisting of stocks and bonds invested in the proportion $\lambda$ in stocks and $1-\lambda$ in bonds is:

$$V_{t+1} = V_t(1+\lambda R_{st} + (1-\lambda R_{bt})) - W_t$$

The withdrawal amount is increased at the rate of monthly inflation 0.0025, so as to maintain a constant level of real consumption.

We compute the probabilities of financial ruin based on the distributional return and risk properties of the Australian stock and bond indexes, and maintain the same assumptions of an initial savings pool of $100 and a retirement period of 30 years. The results are computed for the all-equity strategy, a balanced equity/bond strategy and for the glidepath strategy.9

**Results**

The summary statistics of the sample data are reported in Table 1.10 Note, for later comparison with the analytical approach, negative skewness is observed in the equity index returns.

Table 2 below shows the probabilities of financial ruin at the withdrawal rates of 4 per cent, 5 per cent and 6 per cent for the three investment strategies. As expected, for any given investment strategy, the ruin probability increases as the withdrawal rate is increased. Lower risk portfolios (inclusion of bonds or the glidepath approach) lower the risk of ruin for any given withdrawal rate.

One feature of these simulations is that the distributions of end-of-life wealth are positively skewed and have quite large mean values (relative to the initial wealth).11 The expected positive bequests implied reflect the fact that the annual average rates of return in the historical sample (11.3 per cent and 8.2 per cent p.a. for equities and bonds, respectively) are significantly above the chosen initial withdrawal rates (4 per cent, 5 per cent, and 6 per cent). Thus, in general, withdrawals are below the return on the portfolio such that capital tends to increase. Outcomes of large bequests and low likelihoods of financial ruin observed

![TABLE 1: Summary statistics of sample data — based on monthly continuously compounded returns](image)

<table>
<thead>
<tr>
<th></th>
<th>Mean return</th>
<th>Median return</th>
<th>Standard deviation</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equity index</td>
<td>0.00395</td>
<td>0.01298</td>
<td>0.0500</td>
<td>-2.41</td>
<td>20.15</td>
</tr>
<tr>
<td>Bond index</td>
<td>0.00684</td>
<td>0.0082</td>
<td>0.07</td>
<td>1.48</td>
<td></td>
</tr>
</tbody>
</table>

**TABLE 2: Probabilities of financial ruin — based on the bootstrap simulation approach**

<table>
<thead>
<tr>
<th>Annual withdrawal rate</th>
<th>4%</th>
<th>5%</th>
<th>6%</th>
</tr>
</thead>
<tbody>
<tr>
<td>All equity</td>
<td>0.032</td>
<td>0.084</td>
<td>0.124</td>
</tr>
<tr>
<td>Equity plus bonds</td>
<td>0.00</td>
<td>0.00</td>
<td>0.026</td>
</tr>
<tr>
<td>Glidepath</td>
<td>0.00</td>
<td>0.00</td>
<td>0.004</td>
</tr>
</tbody>
</table>

*The portfolio has an annual return of 0.0974% and a standard deviation of 0.0826.

with, for example, the 4 per cent withdrawal rate may well be regarded by some retirees as too conservative.

Table 3 shows the probabilities of financial ruin derived from the solution to the SPV values based on equation (1) in the Milevsky and Robinson (2005) approach. In this computation the return and standard deviation assumed for the equity portfolio correspond to the average annual return and standard deviation of the equity index over the sample period, and the return and standard deviation of the balanced equity/bond strategy correspond to the portfolio return and standard deviation of the 50/50 equity and bond indexes. The mortality rate $\lambda$ corresponds to the median remaining life time at the given age, which we assume as 30 years at the retirement age of 60. The 4 per cent, 5 per cent and 6 per cent withdrawal rates are maintained for this approach as well. The glidepath strategy that was applied to the bootstrap approach cannot be applied to this approach as it cannot accommodate sequential changes in the portfolio composition in the time path.

The ruin probabilities calculated from the analytical approach are observed to be lower than the values computed with the bootstrap approach for the corresponding investment strategies. This may be due to the fact that the analytical approach assumes a lognormal distribution for the returns, which may not be a valid assumption for the realised return distributions used in the bootstrap, which shows negative skewness and high kurtosis.
The 4 per cent withdrawal rate was observed to result in quite low ruin probabilities with both the analytical and simulation approaches. As such, the ‘4 per cent rule’ may well be regarded by even risk-averse retirees to be a rather conservative rule. A comparison of the results from the two approaches shows that the ruin probabilities of the bootstrapping approach are higher in comparison with the ruin probabilities from the analytical approach.

Conclusions and future research directions

In this paper we have demonstrated the application of two different approaches to the estimation of risk in retirement finance in the Australian context; the bootstrap simulation approach, and the analytical approach of Milevsky and Robinson (2005) that has been made application-friendly with some simplifying assumptions. Financial planners and advisors should pay more attention to the estimation of risk in retirement finance modelling in their analyses and in their advice to clients. This paper provides some useful guidance on the application of two available techniques in this regard.

The 4 per cent withdrawal rate was observed to result in quite low ruin probabilities with both the analytical and simulation approaches. As such, the ‘4 per cent rule’ may well be regarded by even risk-averse retirees to be a rather conservative rule. A comparison of the results from the two approaches shows that the ruin probabilities of the bootstrapping approach are higher in comparison with the ruin probabilities from the analytical approach. This may be due to the fact that the bootstrap simulation would build in the negative skewness observed in the actual return distributions while the analytical approach works on the assumption of a positively skewed lognormal distribution. In that respect, the more recent market experience is better represented in the simulation approach. Whether this experience will persist in the future is, however, a matter of conjecture. Retirement planners using these techniques should be cognisant of these assumptions.

This study has not taken into consideration taxes and transaction costs such as investment expenses and their effects on the sustainable withdrawal rates. Extensions of this analysis can include these factors, and also consider the inclusion of other asset classes and further investment/withdrawal strategies.

References


Notes


2. Financial ruin refers to the exhaustion of the retirement savings pool. This study does not consider other assets and other income streams available to the retiree, including the age pension, to which Australian retirees have recourse in the event of financial hardship.


5. The stock indices computed here make no adjustments for the value of imputation tax credits which came into effect after July 1987. While there are several schools of thought regarding the value of franking credits, making no adjustments for franking credits corresponds to the view that franking credits carry no value.

6. While there are several Australian bond indices available in Datastream the index chosen for the study goes back the furthest in time.

7. A detailed description of the bootstrap resampling technique can be found in Efron (1979).

8. The withdrawal rates of 4 per cent, 5 per cent and 6 per cent correspond to the minimum withdrawal rates recommended by the Australian Taxation Office for allocated pensions for age groups 55–64, 65–74 and 75–79. The rates were reduced to 3 per cent, 3.75 per cent and 4.5 per cent for the 2011 and 2012 tax years.

9. Retirement Planner Calculators such as those available on the Moneysmart website of ASIC (https://www.moneysmart.gov.au/tools-and-resources/calculators-and-tools/retirement-planner) provide projections of retirement income streams and future wealth balances, for a given set of parameter inputs. The projections are based on assumed average future investment returns, not on simulations of actual market data. Retirement calculators are not designed to provide probability risk measures of outcomes.

10. The annualised equity risk premium over the sample period is 3.1 per cent, which is lower than the risk premium of 6.3 per cent reported by Brailsford, Handley and Maheswaran (2012) over a century of return data. This may be due to the influence of the high bond returns recorded over the downward trend in interest rates during the disinflation period of the 1990s.

11. For example, end-of-life wealth is $1,944, $1,178 and $977 in the all-equity, equity plus bonds and glidepath strategy, respectively.
Finsia acknowledges the contribution of the papers from the 17th Melbourne Money and Finance Conference to this issue of JASSA. The conference — Recent Developments in Financial Regulation: An Assessment — was held in July 2012 by the Australian Centre for Financial Studies.

The sponsors of the conference were:
CONSUMER PROTECTION IN THE FINANCIAL SECTOR: recent regulatory developments

ROS GRADY, Conjoint Professor and Chief Executive Officer, Centre for International Finance and Regulation

After examining the significant international and Australian developments in financial consumer protection, this paper indicates that new international principles and standards in this area lack cohesion and leave a number of important issues unanswered. It finds that there remains much work to be done. An earlier version of this paper was presented to the 2012 Australian Centre for Financial Studies’ Melbourne Money and Finance Conference.¹

What is consumer protection?
The current discussion about consumer protection usually revolves around the following concepts:

> **Transparency**: this concept usually refers to disclosure of key terms and conditions, including applicable interest rates and their method of calculation, fees and charges and applicable returns that might be paid to an investor.

> **Product suitability**: this is about ensuring that financial products sold to a customer are suitable for their needs and objectives, with a particular emphasis on the prevention of over-indebtedness.

> **Dispute resolution**: the emphasis here is on access to low-cost, independent, accessible internal and external dispute resolution schemes that are binding on the financial institutions concerned.

> **Financial education**: The premise here is that consumers should be able to understand the nature of basic financial products and services, and the attendant risks, and have the capability to access and use these products and services.

Why is consumer financial protection important?
Some of the key reasons why consumer financial protection is necessary are:

> competitive markets are more likely with informed consumers and where suppliers operate on a level playing field;

> increasingly complex products and services merit more effective disclosure of the risks and benefits and better financial advice regimes;

> the use of new technologies to deliver financial services (such as smart cards and mobile phones) increases the complexities and risks of the payment system and the associated products;

> such rules contribute to financial inclusion policies through building trust in the financial system (especially when coupled with financial education programs); and

> financial stability – the G20 Leaders’ Declaration for the G20 Cannes Summit of 3–4 November 2011 stated: ‘We agree that integration of financial consumer protection policies into regulatory and supervisory frameworks contributes to strengthening financial stability’.

Regulatory developments

International
This section contains a brief summary of the more significant global developments in relation to financial consumer protection regulatory issues. Within this context, the key question is whether we are heading for new international financial consumer protection principles with a new international regulator.

G20 Group
The G20 has been active in promoting further regulatory protections for consumers of financial products and services in the international arena.

The November 2009 Official Declaration of the G20 Pittsburg Summit declared that:²

> 12. Yet our work is not done. Far more needs to be done to protect consumers, depositors, and investors against abusive market practices, promote high quality standards, and help ensure the world does not face a crisis of the scope we have seen. We are committed to take action at the national and international level to raise standards together so that our national authorities implement global standards consistently in a way that ensures a level playing field and avoids fragmentation of markets, protectionism, and regulatory arbitrage.
The G20 Financial Inclusion Experts Group was subsequently formed and, through its Access Through Innovation Sub Group (of which Australia was co-Chair) produced the G20 Principles for Innovative Financial Inclusion. These principles were subsequently endorsed by G20 leaders at their meeting in Toronto in June, 2010. Importantly, Principle 4 highlights the need for:

**Protection: Encourage a comprehensive approach to consumer protection that recognises the roles of government, providers and consumers.**

The need for further international work on enhancing consumer protection was subsequently noted in the G20 Seoul Summit Leaders’ Declaration of 11-12 November, 2010: ‘Enhancing consumer protection: We asked the FSB to work in collaboration with the OECD and international organizations to explore, and report back by the next summit, on options to advance consumer finance protection through informed choice that includes disclosure, transparency and education, protection from fraud, abuse and errors; and recourse and advocacy’ (paragraph 41).

Subsequently an important request was made at the February 2011 meeting of the G20 Finance Ministers and Central Bank Governors for ‘the OECD, the FSB and other relevant international organizations to develop common principles on consumer protection in the field of financial services by our October meeting’ (paragraph 6).

In response to this request, the OECD Financial Consumer Protection Task Force developed the Final High-level Principles on Financial Consumer Protection (FCP Principles), which were endorsed by the G20 Finance Ministers and Central Bank Governors at their meeting on 14–15 October 2011. The FCP Principles are stated to be non-binding, to apply to all financial services sectors and to supplement, and not be a substitute for, relevant international standards or guidelines. They cover the following issues (in summary):

- **Principle 1: Legal, Regulatory and Supervisory Framework** – the emphasis is on financial consumer protection being an integral part of the legal, regulatory and supervisory framework, while recognising the need to take into account the context in individual countries;
- **Principle 2: Role of Oversight Bodies** – the recommendation is that there be an oversight body with specific responsibility for financial consumer protection (dedicated or not) and with appropriate authority, governance and independence;
- **Principle 3: Equitable and Fair Treatment of Consumers** – this principle is all about treating customers ‘equitably, honestly and fairly at all stages of their relationship with financial service providers’.
- **Principle 4: Disclosure and Transparency** – customers should be given notice of the fundamental benefits, risks and terms of a financial product, advised of conflicts of interest and given objective advice;
- **Principle 5: Financial Education and Awareness** – the emphasis is on the need for campaigns to ensure that consumers have the knowledge, skills and confidence to understand the risks with financial products and to make informed choices;
- **Principle 6: Responsible Business Conduct of Financial Services Providers and Authorised Agents** – this principle proposes that financial service providers and their agents should aim to act in the best interests of customers, that the financial capabilities, situation and needs of a customer should be assessed and that remuneration structures should be designed to encourage fair treatment, responsible conduct and to avoid conflicts;
- **Principle 7: Protection of Consumer Assets Against Fraud and Misuse** – this principle proposes that ‘information, control and protection mechanisms should appropriately and with a high degree of certainty protect consumers’ deposits, savings, and other similar financial assets’;
- **Principle 8: Protection of Consumer Data and Privacy** – the call here is for ‘appropriate control and protection mechanisms’ to protect personal information;
- **Principle 9: Complaints Handling and Redress** – the principle proposes that consumers should have access to redress mechanisms which are ‘accessible, affordable, independent, fair, accountable, timely and efficient’; and
- **Principle 10: Competition** – this principle emphasises encouraging competition and making it easy to switch providers.

Subsequently, the G20/OECD Task Force on Financial Consumer Protection developed a 24-month Work Plan to support the implementation of the FCP Principles, which was endorsed by the G20 Leaders at their 2012 Summit held in Los Cabos, with an update to be provided by the Leaders’ Summit in St. Petersburg in 2013. In its role as the current G20 President, Mexico has also called for the establishment of a global consumer protection body and suggested the International Financial Consumer Protection Network (FinCoNet) might take on the role. FinCoNet is an international organisation of market conduct and financial consumer protection supervisors. However, the Leaders’ Declaration at the Los Cabos G20 2012 meeting simply noted the discussion on the FinCoNet Statutes without making a specific statement of support of the proposal for a new international body.
Examples of financial consumer protection initiatives undertaken by the SSBs include:

> IOSCO has released a Consultation Report on consumer protection (suitability) issues relevant to the distribution of complex financial products to retail and non-retail customers (including suitability and disclosure requirements). The public comment period closed on 21 May 2012.12

> The October 2011 Insurance Core Principles, Standards, Guidance and Assessment Methodology released by the IAIS are designed to provide global regulatory standards for the entire insurance industry. They have extensive recommendations relating to the ‘fair treatment of customers’, which encompass many of the consumer protection principles discussed above (see section 19).13

The US Dodd-Frank Act
One would be remiss to finish without mentioning the United States Dodd-Frank Act. The objective of the Act was stated to be:

to promote the financial stability of the United States by improving accountability and transparency in the financial system, to end ‘too big to fail’, to protect the American taxpayer by ending bailouts, to protect consumers from abusive financial services practices, and for other purposes.

Some of the more notable consumer protection reforms were:

> Consumer Financial Protection Bureau: the bureau is an independent entity in the Federal Reserve.

> Responsible lending: Under the ability to repay test (s. 1411), ‘no loan is to be made unless the creditor makes a reasonable and good faith determination based on verified and documented information that, at the time the loan is consummated, the consumer has a reasonable ability to repay the loan, according to its terms, and all applicable taxes, insurance (including mortgage guarantee insurance) and assessments’. Similar rules apply to recommendations made by mortgage originators.

> Fees: there are limits on certain fees (such as prepayment fees).

> Commissions: commissions cannot vary based on the terms of the loan (other than the amount of the principal).

> Licensing: mortgage originators must be licensed and registered.

> Unfair practices: there is a prohibition on abusive or unfair lending practices based on race, ethnicity, gender or age.

> Disclosures: additional disclosures are required in relation to repayments on variable rate loans, settlement charges, origination fees and total interest as a per cent of the principal.
Key Facts Sheets for standard home loans:

Office of Housing Counselling: this new office has functions related to homeownership counselling and rental housing counselling.

Australia and recent financial consumer protection regulation

Some highlights of the initiatives taken by Australia in recent years that are directly relevant to financial consumer protection regulation include the following:

> New responsible lending rules for consumer credit products were introduced in the National Consumer Credit Protection Act 2009 (NCCPA); there are three essential steps in the assessment process: (a) make ‘reasonable enquiries’ about a consumer’s requirements, objectives, financial situation; (b) take reasonable steps to verify the consumer’s financial situation; and (c) make an assessment about whether the credit contract is ‘not unsuitable’ for the consumer. There are also documentary obligations relating to the provision of credit guides, quotes and a copy of the suitability assessment.

> Termination fees: there has been a ban on certain termination fees designed to make it easier for customers to switch banks.¹⁴

> Key Facts Sheets for standard home loans: the new requirement to provide a standard form Key Facts Sheet is designed to give a consumer essential information about a standard form home loan for comparative purposes.¹⁵

> Credit cards: there are new requirements for Key Facts Sheets for credit cards, restrictions on the offering of credit card limit increases and requirements to give further information on statements.¹⁶

> The Future of Financial Advice (FoFA) reforms: these reforms are designed to improve the quality of advice consumers receive and increase access to more affordable kinds of financial advice.¹⁷

> Unfair terms: an ‘unfair’ term which is in a standard form contract for financial products or services will be void. In summary, an ‘unfair term’ exists where there is a significant imbalance between the rights and obligations of the parties, the term is not reasonably necessary to protect the legitimate interests of the parties and it would cause detriment to the weaker party.

> e-Payments code: this new code regulates electronic payments, requires subscribers to give consumers terms and conditions and charges and establishes a regime for mistaken payments.¹⁸

Are we heading towards international consumer protection principles or standards?

The developments indicated above might be considered to go a long way towards providing an international framework for effective consumer protection principles or standards. However, there remain a number of outstanding issues, including the following.

The global standards being developed are not consistent: Individual countries clearly take a different approach to the content of financial consumer protection rules and this is also true of the global initiatives described above (the G20 FCP Principles and the World Bank’s Good Practices). Nevertheless, the issues which are covered are generally consistent and it is to be hoped that a coordinated approach might be agreed.

Implementation is difficult: It is one thing to establish the rules, having them implemented is a significantly harder and more long-term task. This is evidenced by the slow steps being taken in relation to implementation of the G20’s FCP Principles where the implementation effort seems to be focused on information sharing about experience in implementing particular principles, rather than a coordinated international effort.

Financial consumer protection rules need to be supported by financial capability: As noted by the OECD Secretary-General, Angel Gurría when opening the October 2011 OECD G20 Conference on Financial Consumer Protection:

Let me remind you that consumer protection is part of a broader picture that should include prevention and education, and we believe that the G20 should continue putting an emphasis, not only on implementing the principles, but on forthcoming financial education issues.¹⁹

Are some products too complex for consumers in the retail market? In recent years a number of jurisdictions (including Australia) have introduced rules requiring specialised suitability advice and disclosures for certain products offered to retail customers (for example, the responsible lending rules in Australia). However, advice and disclosure requirements are only one part of the story, especially insofar as complex products are concerned. Such products might include, for example, hybrid debt-equity instruments, collateralised debt obligations and complex derivatives. This issue is at the heart of the product intervention powers being proposed.
It is one thing to establish the rules, having them implemented is a significantly harder and more long-term task. This is evidenced by the slow steps being taken in relation to implementation of the G20’s FCP Principles where the implementation effort seems to be focused on information sharing about experience in implementing particular principles, rather than a coordinated international effort.

for the UK’s Financial Conduct Authority and in the review of the European Union’s Markets in Financial Instruments Directive.

What do consumers really need? Do we really understand effective disclosure from the consumer perspective? In recent years there has been an emphasis in behavioural economics on how consumers make decisions, and it is arguable that there should be much more focus on this issue.20

Who is a consumer? The issue here is whether financial consumer protection rules should protect a person who acquires a facility for a business purpose, as well as a personal or a domestic purpose, how a ‘small business’ might be defined and whether there should be a monetary limit on the facilities which are covered.

Conclusion

Significant work has been undertaken to bolster the rules on consumer protection as they apply to financial products and services. However, there is still much more to be done to determine whether we are addressing the right issues and in the most effective way. In particular, the G20’s FCP Principles need to be closely examined against other global initiatives in this area. Active debate is also needed on whether we should be looking for the establishment of a new global financial consumer protection and capability standard setter.

Notes

1. The views expressed in this paper are personal views of the author and do not represent the views of the University of New South Wales or any member of the CIFR Consortium.
13. www.iaisweb.org
15. National Consumer Credit Protection Act 2009 pt 3-2A.
16. National Consumer Credit Protection Act 2009 pt 3-2B.
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**OTC DERIVATIVES IN A POST-GFC WORLD: Australia’s commitment to the G20**

With the over-the-counter (OTC) derivatives market being identified as a key contributor to risk in the global financial crisis (GFC), this paper explores the implications of the regulatory response for the Australian OTC derivatives market. It highlights that the benefits of the proposed new institutional framework need to be considered relative to their potential costs. An earlier version of this paper was presented to the 2012 Australian Centre for Financial Studies’ Melbourne Money and Finance Conference.1

Keywords: OTC derivatives, collateral, counterparty credit risk, transparency, central counterparty institutions, risk management, derivatives pricing.

Trading in over-the-counter (OTC) derivatives markets2 exceeds derivatives trading on organised exchanges, and is concentrated in interest rate, foreign exchange, commodity and credit derivatives. The market offers customised (or bespoke) contracts which are negotiated privately and are traded directly between counterparties. Because OTC derivatives are not traded on an exchange, the parties to a contract are subject to bilateral counterparty risk. Historically, this market has been largely unregulated with respect to disclosure of information between the parties, since it is primarily made up of banks and other highly sophisticated financial institutions. Because trades occur in private, there is low visibility of trades executed.

One of the consequences of the GFC has been a sharply increased focus on regulating OTC derivative markets. The lack of adequate information on OTC derivatives exposures is widely seen as having exacerbated a number of corporate distress situations; highlighting shortcomings in the functioning of the global OTC derivatives market and bringing it to the forefront of regulatory attention. Key areas of increased regulatory focus have included:

- the need for improved trade transparency for regulators and market participants;
- counterparty credit risk mitigation by moving towards centralised counterparty clearing for OTC derivatives; and
- the need for improvements in operational risk management in the execution, management and reporting of OTC trades.

In April 2008, in response to a request from G7 Ministers and central bank governors, the Financial Stability Forum (FSF)3 undertook an analysis of the causes and weaknesses that had produced the turmoil and set out recommendations for increasing the resilience of markets and institutions. In relation to OTC derivative markets, the FSF recommended:

> Authorities will encourage market participants to act promptly to ensure that the settlement, legal and operational infrastructure for over-the-counter derivatives is sound.

The regulatory response to the GFC by Australian financial market regulators has occurred within a framework of, and with regard to, the activities of international regulatory bodies such as the Bank for International Settlements, the Financial Stability Board, the International Accounting Standards Board and national financial market regulators in G20 member countries. This reflects the fact that to avoid regulatory arbitrage and possible creation of systemic risk it is necessary that regulatory reform involves some degree of consistency across markets and national boundaries.

**Australian OTC derivatives regulatory response**

At the Pittsburgh G20 summit in September 2009, Australia along with all other G20 countries made the following commitment:4

All standardized OTC derivative contracts should be traded on exchanges or electronic trading platforms, where appropriate, and cleared through central clearing counterparties by end-2012 at the latest. OTC derivative contracts should be reported to trade repositories. Non-centrally cleared contracts should be subject to higher capital requirements.

This commitment was reaffirmed at the Toronto G20 summit in June 2010 where the G20 countries strengthened their commitment as follows:

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1. An earlier version of this paper was presented to the 2012 Australian Centre for Financial Studies’ Melbourne Money and Finance Conference.
4. This commitment was reaffirmed at the Toronto G20 summit in June 2010.
We agreed to strengthen financial market infrastructure by accelerating the implementation of strong measures to improve transparency and regulatory oversight of ... over-the-counter derivatives in an internationally consistent and non-discriminatory way.

The G20’s commitment was further reaffirmed at the Cannes G20 summit in November 2011, when data and regulatory framework requirements for trade repositories and the treatment of margining for non-CCP contracts were added to the G20 members’ commitment. In summary, the key areas of emphasis identified by the G20 were in relation to:

- market transparency of OTC derivative transactions;
- central counterparty (CCP) clearing;
- capital and margining requirements for non-CCP derivative contracts;
- standardisation of contacts; and
- exchange and electronic platform trading of OTC derivative contracts.

Given that the Australian market represents only 2 per cent of the global notional value of OTC derivatives, it is not surprising that to date Australian regulators’ response to the 2009 Pittsburgh G20 commitments has been cautiously protracted. This is because regulatory outcomes in Australia also need to consider regulatory responses being implemented in the United States, Europe and other G20 member countries, as well as continuing considerations being reported by the Financial Stability Board, Basel Committee on Banking Supervision and other regulatory bodies.

In response to the GFC, and as part of Australia’s G20 commitments, Australia’s financial regulators have been consulting with stakeholders and have issued several reports covering the following issues:

- reporting of trades in prescribed derivatives to eligible trade data repositories;
- clearing of trades in prescribed derivatives through eligible CCPs;
- the treatment of non-CCP contracts; and
- execution of trades in prescribed derivatives on eligible trading platforms.

The latest report recommended that:

- The government consider a broad-based mandatory trade reporting obligation for OTC derivatives.
- Mandatory clearing obligations through CCPs for Australian dollar-dominated interest rate derivatives not be required at this time. However, should substantial industry progress towards central clearing in this class of derivatives not be evident in the near future, the regulators should revisit this recommendation. It is generally considered that the size and cross border nature of the Australian OTC market might pose a challenge to the success of any domestic regulatory incentive. This recommendation requires the government to adopt a ‘wait and see’ approach to allow market participants to voluntarily migrate to central clearing, with a view to reconsidering the need for mandating central clearing, at least for A$ interest rate derivatives, if the migration does not happen soon enough.
- Improvements should occur in relation to the use of adequate credit support arrangements for all OTC derivative transactions. Collateralisation practices should be improved to facilitate daily collateralisation of exposures using amounts of collateral in excess of the daily mark-to-market amount of derivative transactions and in relation to enhanced trade compression and portfolio reconciliation practices. These recommendations directly impact on those transactions that are not subject to central clearing and are currently either managed via bilateral ISDA Master Agreements and the use of ISDA Credit Support Annexes (CSA).
- No recommendations be made in relation to the trade execution obligations until further research is conducted to clearly identify the benefits of mandating all trades to be exchange traded.

**Implications of Australia’s G20 commitment**

The full extent and timing of regulatory change in Australia is still subject to further consultation. However, the broad intentions of the proposed framework are beginning to emerge: to increase the transparency of OTC transactions and reduce counterparty credit risk, and thereby reduce systemic risk. The Australian Government’s proposed framework appears designed to allow Australia to comply with its G20 obligations, while also providing flexibility for the mandatory obligations to be tailored to local market requirements and international regulatory developments. Increased transparency will be achieved through the standardisation of contractual terms and operational processes for OTC contracts, use of trade repositories for data collection for all trades and the introduction of a requirement to use CCPs for nominated OTC derivative products. Counterparty credit risk will be managed by significantly increasing the amount of collateral that will be held against OTC transactions whether they are centrally cleared on CCPs or otherwise.

**Increased transparency of trading**

Under bilateral OTC trading, the characteristics of trading activity, financial innovation and, most importantly, exposures arising from trading, are regarded as being opaque to regulators and market participants. In the GFC, regulators and
The full extent and timing of regulatory change in Australia is still subject to further consultation. However, the broad intentions of the proposed framework are beginning to emerge: to increase the transparency of OTC transactions and reduce counterparty credit risk, and thereby reduce systemic risk.

Market participants were not fully abreast of all of the exposures, the interconnections between counterparties arising from trading, and the levels and timing of exposure concentration by counterparty. They were thus constrained in their ability to effectively supervise the OTC market and monitor trading activity. By requiring all OTC derivative transactions to be reported to trade repositories, comprehensive data regarding all OTC derivatives can be made available publicly and to regulators. Increasing the transparency of trading goes some way to addressing the above issues and simultaneously decreases both the moral hazard and information asymmetries involved in trading. For the data collected by trade repositories to be useful to authorities, ongoing work needs to be completed on the scope of data needed by authorities and on technical issues, such as reporting formats, the legal entity identifier (LEI) and data aggregation. To date, similar to other G20 members, consultation in Australia regarding trade data repositories has identified concerns about data confidentiality, costs of implementation and concerns about the identification of proprietary trading strategies. It can be expected that there will be some resistance to this initiative and hence a legislative framework can be expected that there will be some resistance to this proposal.12

To manage the exposure to the counterparties if netting is limited between the counterparties, the CCP will need to impose larger margin requirements, larger contributions to the default funds or stricter position limits for counterparties. Duffie and Zhu noted that clearing different classes of derivatives in separate CCPs always increases counterparty exposures relative to clearing the combined set of derivatives in a single CCP. Further, the flow of collateral to CCPs will require the CCPs to have very efficient and effective cash flow management systems and capital backing.

The transition to CCP clearing of OTC derivative contracts will require a significant change to current Australian market practice and structure as there are currently no CCPs operating in Australia. Under a CCP

Centralised counterparties
Contracts traded in the Australian OTC derivatives market are currently dominated by bilateral OTC agreements, typically under ISDA Master Agreements, with many also having Credit Support Annexures (CSAs). As noted by The Council of Financial Regulators, CSA coverage varies widely in the Australian market depending on the particular OTC product, with buy-side market participants tending to have lower levels of CSA coverage than sell-side banks. In the Australian OTC derivative market when trading is conducted with CSAs, variation margins in the form of collateral are paid (mostly in cash), at a frequency determined by the contract to reflect mark-to-market losses following a change in prices. A CSA may allow for some flexibility in mark-to-market payments, by setting an unsecured threshold, i.e. a threshold below which a mark-to-market variation margin need not be paid. The calibration of unsecured thresholds and minimum transfer amounts typically reflects the financial standing of the counterparty. Usually there is no requirement for an initial margin to be charged.

One crucial characteristic of a CCP is that it mutualises credit and market risk, spreading credit risk among all of its participants. But the capacity of a CCP to absorb risk is determined by the equity capital, the margin it collects and the practice of marking positions to market. The money held will present its own problems as the CCPs seek to reinvest cash held as collateral. It is important to note that CCPs do not eliminate counterparty credit risk, can lead to credit risk concentration and may not be default-free. In the event of a default by a counterparty, the CCP will settle the obligations to close out existing contracts. Losses in excess of the margin held by a CCP will be met from the CCPs own financial resources, external risk capital and a risk layer in which members of the CCP cover losses arising from defaulting members. To manage the exposure to the counterparties if netting is limited between the counterparties, the CCP will need to impose larger margin requirements, larger contributions to the default funds or stricter position limits for counterparties. Duffie and Zhu noted that clearing different classes of derivatives in separate CCPs always increases counterparty exposures relative to clearing the combined set of derivatives in a single CCP. Further, the flow of collateral to CCPs will require the CCPs to have very efficient and effective cash flow management systems and capital backing.

The transition to CCP clearing of OTC derivative contracts will require a significant change to current Australian market practice and structure as there are currently no CCPs operating in Australia. Under a CCP
transition from CSA contracts to CCPs is expected to result in an increase in collateral requirements due to the cost of the initial margin, and variation margins without thresholds which will need to be paid by both parties to their respective CCPs.

Collateral requirements will cause challenges due to the restricted supply and potential high demand for high-quality collateral. As noted by Singh, large banks active in the OTC derivatives market typically do not hold collateral against all the positions in their trading book; they can be under-collateralised and often allow re-hypothecation to others. For example, government securities received by one bank as collateral for a particular trade could be transferred by it to another bank to meet collateral obligations for another trade, and so on. Since CCPs would require all positions to have collateral against them, off-loading a significant portion of OTC derivatives transactions to CCPs would prevent such re-use of the same collateral and require large increases in posted collateral (adding to the increased demand for high-quality assets for collateral purposes associated with initial margins), possibly requiring large banks to raise more capital or to reduce their trading activity. The resulting costs suggest that most large banks will be reluctant to offload their positions to CCPs.

Operationally, in the event that there is more than one CCP used by market participants in a particular market, it is important that interoperability is permitted and that multilateral cross-guarantee agreements be established between CCPs. As noted by JPMorgan, as the cost of collateral increases, collateral management and collateral optimisation will become the new battleground for efficiency. Those institutions which can efficiently manage collateral across cleared and non-cleared positions will enjoy a significant competitive advantage. The total net effect on a firm’s collateral, liquidity and reliance on short-term funding markets depends on their specific OTC derivative product mix and the number of counterparty relationships under which it operates, and also whether the CCP will allow bilateral or multilateral netting.

The introduction of centralised clearing of OTC derivatives will cause changes to legal and operational aspects, and also affect market participants’ balance sheets and income statements due to changes in collateral management and the impact on OTC derivative pricing.

TREATMENT OF NON-CCP CONTRACTS

Not all OTC derivative contracts will be cleared via a CCP. Consistent with international regulators, Australian regulators have indicated the need for non-CCP contracts to be subject to higher capital charges and margining requirements. The higher capital and margining requirements for non-centrally cleared contracts relative to centrally cleared contracts are expected to provide incentives for use of CSA agreements and the central clearing of contracts.

IMPACT ON OTC DERIVATIVE PRICING

The GFC has directly affected OTC derivative pricing. The classical pricing framework, based on a single yield curve used to calculate forward rates and discount factors, has been partially abandoned, and a new modern pricing approach is now prevalent among practitioners. This revised approach takes into account the market segmentation caused by different collateral and settlement mechanisms. The increased focus on credit risk has resulted in a multiple curve framework for OTC derivative contract pricing, to accommodate daily collateral rebalancing under CSA arrangements and the use of credit valuation adjustments.

Further, collateral arrangements require funding. The increased focus on credit in the post-GFC world has resulted in a time-varying differential between funding costs and the return on collateral. These differences will affect both the regulatory capital requirements for financial institutions and the pricing of derivatives. Finger noted that with the increased use of CCPs, risk management for market participants must shift from managing counterparty risk to the management of liquidity requirements for CCP margin needs. The management of these liquidity requirements will be reflected in derivative pricing via the liquidity (or funding) valuation adjustment. This adjustment reflects the cost of financing enough liquidity to support current and possible future margin requirements. To reflect the different levels of collateral and liquidity impacts, the introduction of CCPs to the Australian market will further complicate
the pricing of derivatives as there will also be a pricing differential between those contracts involving:

> uncollateralised positions;
> collateralised positions under CSA arrangements; and
> collateralised positions cleared via a CCP.

Conclusions

The proposed regulatory framework arising from Australia’s G20 commitments should lead to significant changes in the structure of the Australian OTC derivative market and its regulation. Any changes that increase informational efficiency or decrease the level of systemic counterparty risk should be seen as reasonable.

The proposed changes should assist with the management of systemic risk by providing important information about the operation of the OTC derivatives market and also address some concerns with regard to counterparty credit risk in this market. In Australia, the proposed changes are yet to be finalised and regulated and are therefore still to be tested in an operational framework. The proposed benefits of any regulatory change will need to be considered in light of their impact on: the creation of concentration of risk in central counterparty institutions; increased reliance on short-term funding due to collateral management requirements; potential increases in liquidity risk; legal and regulatory uncertainty arising from regulatory differences between countries; and derivative pricing and risk management.

Notes

1. Acknowledgement: The authors are grateful for feedback received and wish to thank Professor Kevin Davis and an anonymous referee for comments made on the paper.

2. In Australia, the Australian Financial Markets Association (AFMA) in its 2010–11 survey found that over the year ending June 2011, annual turnover of OTC derivatives was in excess of $54 trillion, with OTC FX derivatives a little above $33 trillion and OTC interest rate derivatives turnover was around $20 trillion. Turnover of other OTC derivatives products was much lower; the next most active market was credit derivatives, with an annual turnover of around $300 billion over this period. Australian Financial Markets Association, 2011 Australian Financial Markets Report, available at http://www.afma.com.au/afma/w/-/assets/main/lib360013/2011%20afmr.pdf

3. In November 2008 the FSF became the Financial Stability Board (FSB).


7. A central counterparty (CCP) interposes itself between the buyer and the seller and, through legal novation, assumes the rights and obligations of both parties.


9. It does appear that the EU and the United States are at a more advanced stage of implementing regulatory reform than their G20 counterparts, despite notable progress being recently reported in Canada, Hong Kong and Japan.


14. Increased standardisation can improve operational efficiencies, mitigate operational risk and increase the netting and central clearing potential for the appropriate products.


17. ISDA 2012, ‘Collateral damage’, *derivativViews*, indicates that ‘the real elephant in the room is whether the market place will come up with all the collateral that is required, and if it does, what the liquidity implications for the real economy will be’, available at http://isda.derivativviews.org/2012/06/14/collateral-damage/


19. A multilateral cross-guarantee agreement provides a mechanism for sharing excess collateral after the closeout/bankruptcy of a market participant at a different clearing agency. This would allow CCPs to have legal priority over the collateral of a market participant if it should default.


NEW ZEALAND INSIDER TRADING REGULATION: A market assessment

Many countries have taken what appears to be a tough stance on insider trading, treating it as a criminal offence. While this approach is often very popular with the general public, there is little evidence that these laws are effective. In this paper, we assess the market impact of two consecutive changes in insider trading regulation in New Zealand in the past decade, discussing the findings of two recent studies and the way forward. An earlier version of this paper was presented to the 2012 Australian Centre for Financial Studies’ Melbourne Money and Finance Conference.

Keywords: insider trading, financial regulation, Securities Market Amendment Act, deterrent effect, criminal sanctions.
heavily prior to the announcement of an acquisition of McCollum Printer. Watson avoided prosecution due to a legal technicality and only surrendered his profit without additional penalties (New Zealand Securities Commission 1998). In another case, Kerry Hoggard, then Chairman of Fletcher Challenge, purchased heavily before a major restructuring announcement (New Zealand Herald 2000). This case was settled out of court with financial penalties but other penalties relating to his ability to serve as a director were not imposed. In 1999, the government argued that the failure to convict insiders, among other issues, had eroded investor confidence and proposed changes to the securities laws to address these flaws (for a discussion on this see the report by the Ministry of Economic Development 2002).

The first change in the laws, introduced in 2001 and enacted in 2002, replaced the private enforcement regime and tasked a local watchdog, the New Zealand Securities Commission, with the prosecution of insider trading. Soon after the enactment, the Commission attempted prosecution of a number of insiders in Transrail, a local railroad company, who sold heavily prior to the announcement of poor financial performance and collectively avoided $47 million in losses. The prosecution wound up settling out of court,resulting in insiders repaying $27 million without an admission of guilt. While not completely successful, this demonstrated a willingness to prosecute insiders.

In earlier discussions on the 2002 laws, the introduction of criminal sanctions was mooted as a way of increasing deterrence and was introduced in a second round of amendments in 2006. These amendments, which came into effect in February 2008, added criminal sanctions of a maximum of five years in jail and/or a $300,000 fine to the existing civil sanctions available. Since its enactment in 2008, no attempts have been made by the public regulator to bring a prosecution against insiders.

The market impact of the insider trading regulations

Evaluating the effectiveness of insider trading laws is not straightforward because of the opaque nature of insider trading. As a result, studies examining the efficacy of insider trading laws have relied on indirect measures. For example, Bhattacharya and Daouk (2002, 2009) use changes in the country-level cost of capital; Benz (2005) looks at price synchronicity, the concentration of shareholdings and liquidity; while Bris (2005) examines price run-ups and abnormal trading prior to takeover announcements. Gilbert et al. (2007) consider the impact of the 2002 law in New Zealand on the volatility and liquidity of firms.

An alternative approach to studying the market impact of insider trading laws is to examine the effect of the introduction of the law on the cost of trading in the market. In particular, the modern market microstructure literature has developed models that allow the cost of trading, i.e. the bid-ask spread, to be decomposed into several components. Bid-ask spreads consist of two key components: the operational costs faced by liquidity providers, the so-called order-processing and inventory holding costs; and the information asymmetry costs. The latter component is considered as a compensation for liquidity providers who risk trading against a better-informed counterparty such as insiders. As a consequence, the amount of compensation demanded gives a strong indication of the market’s expectations about the prevalence and profitability of informed trading and therefore also provides an indication of the amount of insider trading. For this reason, we use several measures of transaction costs and information asymmetry to assess the impact of the introduction of two subsequent insider trading law changes in New Zealand. If the introduction of these new pieces of legislation were successful (and insiders are deterred from trading on non-public information), then the information asymmetry and bid-ask spreads should decrease, indicating an improvement in market quality.

**The Securities Market Amendment Act 2002**

The first study we conducted (Frijns et al. 2008) examined the changes in trading costs as a result of the 2002 law amendment in New Zealand. This amendment replaced the existing private enforcement regime with a public system whereby the financial market’s regulator (New Zealand Securities Commission) was tasked with prosecuting insiders. We argued that this would increase the probability of prosecution for insiders and so should be viewed by the market as a positive development. As such, we hypothesised that spreads would decrease, both in total and the specific component related to the cost of information asymmetry. To measure the information asymmetry component, we employed the Madhavan et al. (1997) bid-ask spread decomposition model, measured as

\[
\Delta p = \theta (x_t - \mu x_t) + \phi (x_t - \mu x_t) + u_t,
\]

where \( x_t \) is a trade indicator denoting whether a trade is buyer or seller initiated, \( \theta \) is the compensation for information asymmetry, \( p \) is the autocorrelation of the order flow, and \( \phi \) is the compensation for order-processing and inventory holding costs. We estimate this model using generalised methods of moments. We examine the 70 most active firms due to the liquidity requirements of this model and examine an 18-month period before and after the introduction of the law.

The empirical findings supported the hypothesis that a public watchdog would be perceived as more
effective by the market. We noticed a significant decrease in both the percentage spread and the total spread, by 0.14 per cent and 0.69 cents per share, respectively. In addition, the proportion of the spread composed of information asymmetry costs (\(\theta/(\theta+\phi)\)) reduced by 3.74 per cent. These findings demonstrate that the legislative changes resulted in lower transaction costs, primarily driven by a reduction in the perceived likelihood of encountering an informed counterparty in the market.

The Securities Market Amendment Act 2008

The SMAA 2008 amendment introduced criminal sanctions for breaches of insider trading laws, on the basis that these sanctions represent a much stronger deterrent due to the harshness of the penalty which, in the case of New Zealand, is up to five years in jail. In Frijns et al. (2012) we point out that the actual deterrent effect is an empirical issue, as criminal sanctions increase the severity of the penalty but also reduce the likelihood of prosecution. This is due to the fact that criminal sanctions involve a considerably higher burden of proof, beyond a reasonable doubt, as opposed to on the balance of probabilities. If criminal sanctions do increase the deterrent effect of insider trading laws, then as with the 2002 amendment, we would expect to see the market react by lowering the spreads and reducing the compensation for information asymmetry. However, Bris (2005) and Bhattacharya and Daouk (2009) have shown that unenforceable laws can have a detrimental effect on the market or, as Bhattacharya and Daouk put it, ‘no law is better than a good law’. Therefore, if enforceability has decreased due to the introduction of criminal sanctions, then we expect the quality of the market to deteriorate.

We examined the efficacy of the 2008 amendments using measures similar to those in the 2002 study.8 Our findings on the impact of the 2008 SMAA showed that spreads and associated measures actually worsened by a statistically significant margin. For the 12- and six-month windows before and after the enactment of the new regulation, we found significant increases in the average level of all our measures. In our analysis, we controlled for differences in other variables that may affect spreads such as market value, market-to-book value ratio, trades per day, and volatility, and our results remained robust. These results are consistent with the evidence and arguments of Bris (2005) and Bhattacharya and Daouk (2009).

Due to the timing of the introduction of the new law, we needed to control for the potential confounding effects from the global financial crisis. We did this by following a technique known as the difference-in-difference analysis. This method compares the change in the spread measures of New Zealand firms with those of a control group (in our case a sample of Australian firms selected for their similarity to our New Zealand firms based on industry, size, market-to-book value ratio and price). Our findings were consistent with those mentioned earlier, i.e. the introduction of criminal sanctions led to a worsening of the various spread measures.

Moving forward

In this study, we assessed the introduction of two pieces of insider trading regulation in New Zealand. In the first piece of legislation, the government introduced a tighter disclosure regime and gave the enforcement authority to a public regulator, the New Zealand Securities Commission. In the second piece of legislation, the government went a step further and introduced criminal sanctions. The results of our two studies illustrate the point made by Hirschleifer (2008) that some financial regulation is driven by psychological biases and may not be optimal from an economic viewpoint. The 2002 amendment was driven by a clear view of the failings of the previous insider trading regime, namely the inability of private parties to successfully prosecute insiders. Part of that review floated the idea of criminal sanctions for insider trading, but there was little support for them at that time. Between the time that the 2002 amendments were fully enacted in 2004 and when the proposal to criminalise insider trading was re-proposed in 2006 there was little opportunity to assess the efficacy of the 2002 changes. What appears to have driven the introduction of criminal sanctions is the belief that tough sanctions would deter insiders.

In early 2011, the new Financial Markets Authority (FMA) was established, replacing the New Zealand Securities Commission. The FMA was tasked with stronger enforcement of the existing legislation and, since its establishment, several cases of non-disclosure/wrongful disclosure have been brought to court. It will be interesting to see whether the FMA will be able to successfully prosecute insider trading activity in a criminal court. Such a successful prosecution would send a strong signal to the market and, according to Bhattacharya and Daouk (2009), should significantly improve market quality.
Notes
1. This point was stressed by the then Chairman of the Australian Securities and Investments Commission who noted that despite recent successful criminal prosecutions, the burden of proof and the evidence required remained problematic (D’Aloisio 2010).
2. Specific measures we considered were quoted and percentage spread, information asymmetry and volatility. For more details see Frijns et al. (2008).
3. We determine buyer-initiated trades as those that occur at or above the ask price, seller initiated as those that occur at or below the bid price and assign a 0 to those that occur within the spreads.
4. This is the probability that a buy is followed by a buy, or a sell by a sell.
5. Specific details of the orthogonality conditions can be found in Frijns et al. (2008).
6. On the balance of probabilities means that if it is more likely that a person committed the offence than not then guilt is established.
7. Bhattacharya and Daouk (2009) argue and show empirically that unenforceable laws will scare away those insiders who follow the rules, but do nothing to deter those who do not follow the rules. The outcome will be that those who do not follow the law will exploit their information advantage with greater intensity, increasing the overall harm from insider trading.
8. We considered percentage and effective spread, price impact and information asymmetry. More details on the analysis can be found in Frijns et al. (2012).

References