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CONTENTS
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FROM THE
Managing Editor

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This issue of *JASSA* focuses on a number of critical economic, taxation and equity markets issues currently facing the finance industry, policy makers and regulators, both in Australia and internationally. We open with a detailed discussion of some of the key explanations for the relatively low growth in advanced economies in recent years, and whether this is due to secular stagnation.

The special section of this issue is based around two longer papers prepared for the Centre for International Finance and Regulation (CIFR) and the Australian Centre for Financial Studies (ACFS). These formed the basis of two recent symposia of 'Dividend Imputation: What effects has it had; and should it be dismantled?'. The short extracts from those papers presented here are accompanied by two further invited papers by Andrew Ainsworth and Stephen Gray. This discussion is particularly timely in the lead-up to the federal Budget as the Government considers a range to tax policy options, including whether to remove imputation, as a number of other countries have done in the past 10 years. While not subject to the usual double-blind process, each of these papers was reviewed by a member of the Editorial Board and by me prior to inclusion.

The first paper in the main section of the journal is also an invited paper. Ivailo Arsov and Ashvini Ravimohan from the Reserve Bank of Australia provide an overview of the secular stagnation hypothesis as well as several alternative explanations for the slow economic recovery in the major advanced economies since the global financial crisis (GFC). Arsov and Ravimohan conclude that while secular stagnation, either demand-side or supply-side, is one possible explanation for the recent economic performance in advanced economies, there are a number of other possible explanations that emphasise less secular developments (such as a post-GFC debt overhang). They suggest that it is too early to be conclusive about whether the lower growth in these economies is due to secular stagnation or structural issues, and that while estimates indicates that the natural rate of interest has fallen, particularly through the GFC period, it is not clear that this is acting as a binding constraint on monetary policy.

The next two papers were submitted and subject to the usual double-blind refereeing process. Clive Gaunt examines the Australian evidence on momentum crashes. He notes that while previous studies have reported that significant alpha can be generated in various international equity markets by employing a momentum strategy — i.e. buying past winners and short selling past losers — the strategy sometimes crashes, generating large negative returns over one or more consecutive months. Gaunt's study, which uses Australian data, generally confirms recent US findings that momentum crashes tend to occur following steep market declines and are characterised by large positive returns by the past Loser portfolio rather than large negative returns by the past Winner portfolio. The author indicates that asset managers who employ a (long–short) momentum strategy should be aware that the strategy will infrequently crash, but that these crashes may to some extent be predictable as they tend to follow periods of very large losses to the loser portfolio. He believes that understanding this, and the significant risk changes that occur, potentially offers managers the opportunity to modify the strategy at those times to mitigate losses, or perhaps even generate positive returns.

Also focusing on equities markets, Ron Bird and Hamza Ajmal address the mispricing of Australian initial public offerings (IPOs) and the well-known anomaly of the incidence of high returns on the first day that an IPO is listed. Overall, their findings suggest that investors do very well both from purchasing IPOs when they are issued, holding them for up to the first year of trading, and also purchasing IPOs after they are listed and holding them for at least the first year of trading. Based on the average returns across their sample, Bird and Ajmal find evidence of large underpricing of IPOs consistent with that found in many previous Australian and international studies but they do not find any evidence of a large subsequent reversal suggesting that the average Australian IPO is significantly underpriced. They also identify that the IPO returns are heavily right-skewed suggesting that the median return might provide a better insight into the pricing behaviour of IPOs.

The special section of this issue of JASSA begins with a paper in which I provide an overview of the effects of dividend imputation on the Australian financial system. The paper addresses the ongoing debate about the precise effects of the dividend imputation system on the Australian financial sector, company and investor behaviour, and real sector consequences. It argues that in any discussions about the costs, benefits and the future of imputation, a critical but largely ignored issue is the need to identify the appropriate counterfactual. Any alternative will involve some differences between Australian and overseas tax systems and differential treatment between investors, which will involve various types of distortions. Based on the available evidence, the paper argues that the benefits of imputation outweigh its costs. Moreover, the disruption to financial markets caused by substantive change such as abolishing imputation would be substantial. Consequently the conclusion drawn is that the case for change is not proven.

The focus of the study by Andrew Ainsworth, Graham Partington and Geoffrey J Warren is on the impact of dividend imputation on share prices, the cost of capital and corporate behaviour. They argue that although the theory and evidence may be unclear, the notion that imputation has no impact on share prices and the cost of capital sits at the extreme of the spectrum of possibilities. Instead, they suggest it is more likely that imputation has had some effect on share prices, even if just in certain situations such as for smaller, domestic companies. Further, they say imputation appears to have influenced behaviours, some of which have been beneficial: it has encouraged higher dividend payouts, and possibly lower corporate leverage and a propensity for Australian companies to invest domestically at the margin. On balance, they believe that the imputation system has made a positive contribution to the Australian economy.

Stephen Gray's paper indicates that the contentious debate about the valuation of dividend imputation credits, which has continued since the system was introduced in 1987, has been heightened in the regulatory setting. Gray suggests that although an accurate estimate of the cost of capital is important for every firm, it is particularly important for regulated infrastructure firms where a regulator sets the allowed revenue each year in accordance with its estimate of the cost of capital. The paper explains how the regulatory allowance depends on the estimated value of imputation credits and summarises the debate that has occurred, over many years, in this setting. Gray notes that if the regulator overestimates the value of imputation credits, investors in an infrastructure firm will be undercompensated and vice versa.

In the final paper of this issue, Andrew Ainsworth suggests that the international experience with dividend imputation is an overlooked aspect of the debate surrounding Australia's dividend imputation system. His paper argues that despite their political and economic differences, there is much that we can learn from the nine countries that removed dividend imputation systems similar to Australia's between 1999 and 2008. Ainsworth notes that if the debate surrounding the removal of imputation in Australia continues, there are two questions that will need to be addressed. What system might replace dividend imputation? Do we understand any potential unintended consequences from these different tax systems? He argues that the continued changes to how dividends are taxed by some of the countries that have removed imputation suggest that the answers to these two questions are not straightforward.

We are very keen to encourage papers, both from practitioners and those in academia, focusing on the pressing issues for those working in the finance industry and on rigorous discussions about the latest developments in applied finance. I encourage anyone interested in contributing to the journal to contact us at membership@finsia.com.

SECULAR STAGNATION:

A review of the key arguments

IVAILO ARSOV and ASHVINI RAVIMOHAN[1]

This article provides an overview of the secular stagnation hypothesis, the debate that has surrounded it and some of the key alternative explanations for the relatively low growth in advanced economies over recent years.[2]

The economic recovery in the major advanced economies after the global financial crisis (GFC) has been slow. Real GDP growth has been a little under 2 per cent per annum since 2010, compared with growth of nearly 3 per cent in the decade before the crisis. Similarly, growth in GDP per capita in advanced economies has almost halved since the crisis to around 1 per cent per annum. As a result, after eight years, the level of output has only recently returned to around the pre-GFC peaks in the euro area and Japan. While US output is noticeably above its pre-GFC level, it is only slightly above its previous peak in per capita terms (Figure 1). The major weakness in economic output has come from business investment, particularly in the euro area and Japan where investment remains below its pre-GFC peak.[3]

This weak growth has occurred in an environment of unprecedented policy accommodation. Central bank policy rates have been effectively at zero in the United States since 2009 and in the euro area since 2013, and for a much longer period in Japan. Central banks' balance sheets have expanded significantly, first to manage the fallout from the GFC, and later to support the economic recovery. Fiscal policy was also expansionary during the GFC, although it has been close to neutral more recently after a few years of fiscal tightening.

FIGURE 1: Major Advanced Economies — Actual and Potential GDP*

Actual 2007 GDP average = 100
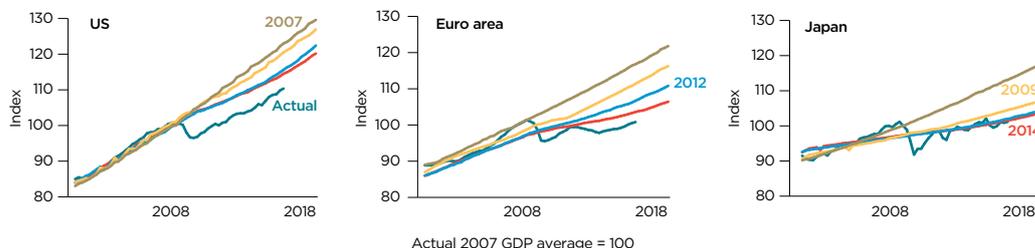
> * Lines with year labels represent estimates of the level of potential GDP made in the respective year. For the euro area and Japan the 2007 vintage forecasts are at end 2006. The 2006 and 2009 vintages of the potential GDP forecast for the euro area and Japan are for the subsequent two years only, and beyond this horizon the potential GDP forecasts are based on long-run average GDP growth forecasts from Consensus Economics.

Sources: Congressional Budget Office, Consensus Economics, OECD, RBA, Thomson Reuters.

Estimates of potential GDP, i.e. what the economy can produce by fully employing its labour and capital resources without causing inflation to deviate from the central bank's target, have been revised significantly lower since the GFC (Figure 1). Relative to published projections of potential GDP, actual GDP in the United States was around 11 per cent lower in 2015 than was expected in 2007. Similarly, GDP in the euro area was around 14 per cent below the projections of potential 2015 GDP made in 2007. The story is similar in Japan. Economic growth has generally surprised on the downside. In almost every year since the start of the GFC, output in the major advanced economies has ended below what had been expected by consensus forecasts at the start of the respective year (Figure 2).

FIGURE 2: Advanced Economies — GDP Growth Surprises*
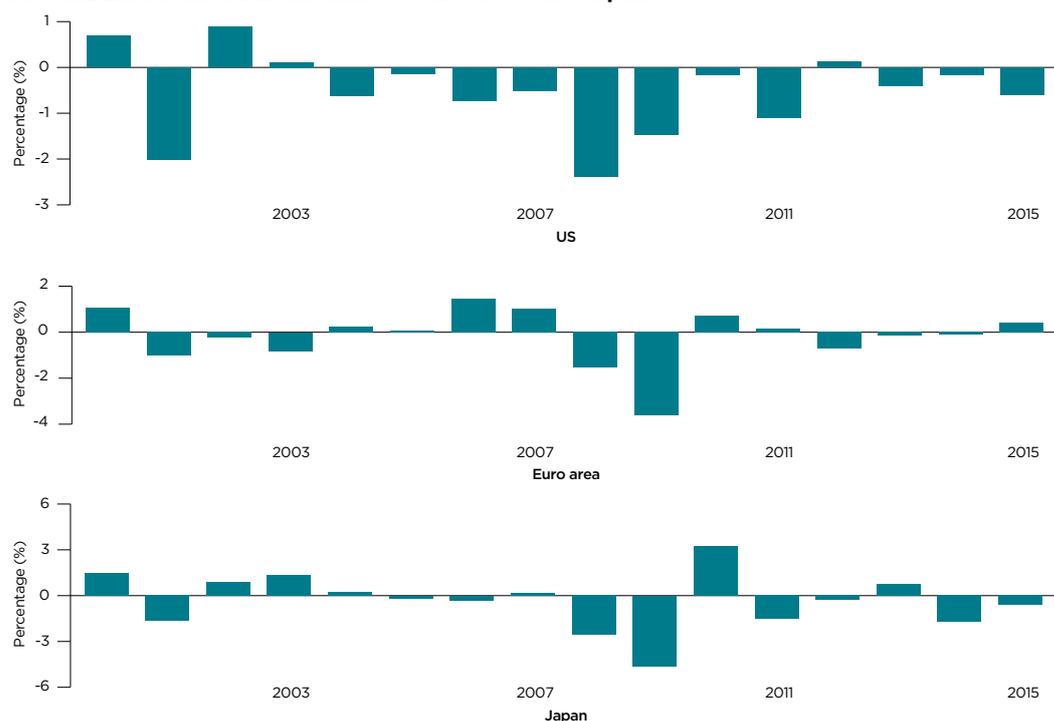
* GDP growth surprise is measured by the difference between actual GDP growth and the Consensus Economics GDP growth forecast at the start of the corresponding year. For 2015, the surprise is measured by the change in the Consensus Economics forecast from the start of 2015 to November 2015.

Sources: Consensus Economics, Thomson Reuters.

Understanding why growth has been so disappointing is important because this may inform expectations about future GDP growth and consequently decisions by policy makers and financial market participants such as asset managers.

A number of explanations for the slowdown in growth have been proposed. Some argue that it reflects headwinds from the GFC (see, for example, Bernanke 2012; Hamilton et al. 2015) or the slow unwinding of the debt overhang (Rogoff and Lo 2015). Others believe that more secular forces have been at play. One hypothesis that has attracted significant attention over the past couple of years is that of (demand-side) secular stagnation, which was proposed by Larry Summers (Summers 2013) and emphasises as an explanation a persistent shortfall in demand that cannot be rectified by conventional, or even less conventional, monetary policy tools. Others focus on secular developments on the supply side that have reduced potential GDP growth (Gordon 2015).

The secular stagnation hypothesis

The demand-side view

The original idea of secular stagnation was proposed by Alvin Hansen in 1938 (and first published in Hansen 1939). He argued that the Great Depression might be the start of a new era of ongoing unemployment and economic stagnation without any natural force pushing the economy towards full employment. The main driving forces of this secular stagnation were the decline in the US birth rate at the time and insufficient aggregate demand. Hansen's fears of secular stagnation quickly passed into history. World War II led to a very large increase in government spending thus ending concerns of insufficient demand. The post-World War II pick up in the fertility rate, the so-called baby boom, drastically changed the population dynamics in the United States, erasing the problem of excess savings driven by an ageing population.

Larry Summers revived the idea of secular stagnation in late 2013 to explain the sluggish growth in the US economy after the GFC. This proposition, which has been further refined by Summers (2014a, 2014b), hypothesises that since a few years before the GFC, the United States and other advanced economies have been facing increasing difficulty achieving simultaneously 'adequate growth', full capacity utilisation and financial stability because of a substantial decline in the natural rate of interest.

The natural rate of interest (NRI) is defined as the real short term interest rate consistent with the economy operating at its full potential once transitory shocks to aggregate supply or demand have abated, and there being no upward or downward pressures on the inflation rate relative to its trend (Laubach and Williams 2015). Conceptually, a central bank can achieve full employment and price stability by setting its real policy rate, i.e. the nominal policy rate less inflation, above (below) the NRI when the economy is operating above (below) its potential. However, theory suggests that if the natural rate of interest has declined to a sufficiently low negative level, monetary policy will be less effective in restoring economic activity to its potential level because nominal interest rates cannot fall below zero.[4]

This proposition, which has been further refined by Summers (2014a, 2014b), hypothesises that since a few years before the GFC, the United States and other advanced economies have been facing increasing difficulty achieving simultaneously 'adequate growth', full capacity utilisation and financial stability because of a substantial decline in the natural rate of interest.

With inflation targets of around 2 per cent in most advanced economies, Summers' exposition of the secular stagnation hypothesis suggests that the NRI is below minus 2 per cent. Although, in an environment where actual inflation is persistently below target, a NRI of above minus 2 per cent could be consistent with the hypothesis. The other key idea of this hypothesis is that the reasons for the negative NRI are secular, i.e. the situation is occurring for an indefinably long period for non cyclical reasons that include (Summers 2014a, 2014b):

> reduced demand for debt-financed investment as a result of: (1) the legacy of excessive leverage leading into the GFC; (2) restrictions on financial intermediation in the aftermath of the GFC; and (3) growth being increasingly led by technology companies that are less capital intensive than the companies that have traditionally led growth

> declining rates of population growth

> changes in income distribution increasing the propensity to save, including an increase in within country income inequality across households and the increase in retained corporate earnings

> declining relative prices of capital goods.

More recently the global aspects of the secular stagnation hypothesis have received increased attention. Summers (2015) emphasises the importance of the increase in savings in emerging market economies since the late 1990s, the so-called 'global savings glut' formalised in Bernanke (2005) and further explored in Bernanke (2011), as a key factor contributing to the excess savings and decline in the NRI. In Summers' view the global savings glut is not a transitory phenomenon.

The supply-side view
An alternative supply-side explanation for the sluggish growth in recent years also emphasises secular factors. In this view, growth outcomes have been shaped by the decline in the potential GDP growth rate since the mid-2000s. Focusing on the United States, Gordon (2015) argues that the key factors are:

> slowing productivity growth, because the information and communications technology (ICT) revolution has begun to encounter diminishing returns since the mid-2000s

> slowing labour input growth due to slowing population growth and the decline in the labour force participation rate because of ageing demographics.[5]

Some of these factors are common to both views of secular stagnation. For example, demographic changes can increase desired savings when the population is initially younger and subsequently lower labour supply as the population ages, while persistent demand shortfall can reinforce a supply-side slowdown in productivity due to hysteresis effects.

The next sections address the key ideas of secular stagnation: how the natural rate of interest, and other interest rates that are likely to be closely related to it, have evolved since the 1980s; how potential GDP growth has evolved since the 2000s; and what factors may account for these developments.

Has the natural rate of interest fallen?

A large number of factors can influence the NRI, including productivity growth, demographics and the evolution of the global economy (Laubach and Williams 2003). The NRI is not directly observable and hence needs to be estimated. Most estimates suggest that the NRI has been around or slightly below zero in the United States since the GFC, and that a large part of the decline in the NRI occurred during the GFC. Evidence from market-based 'risk-free' interest rates, which can be expected to be closely related to the NRI, also point to a prolonged decline in real interest rates since at least the 1990s, with a significant decline occurring during the GFC. However, interpreting these estimates and observations in light of the secular stagnation hypothesis requires caution because different methods yield different results.

The model developed by Laubach and Williams (2003) has become one of the seminal approaches to estimating the NRI.[6] This estimate of the US NRI displays two periods of significant decline since 1980: a moderate secular decline to around 2 per cent over the two and a half decades preceding the GFC; and a second, substantial and sharp decline during the GFC (Figure 3). Most of the gradual decline in the 1990 to 2007 period is attributed to factors other than changes in the estimated growth rate of potential GDP; in contrast, around half of the decline in the 2007 to 2015 period is due to the decline in the estimated potential GDP growth rate and half to other factors (Laubach and Williams 2015).

FIGURE 3: US — Natural Rate of Interest*
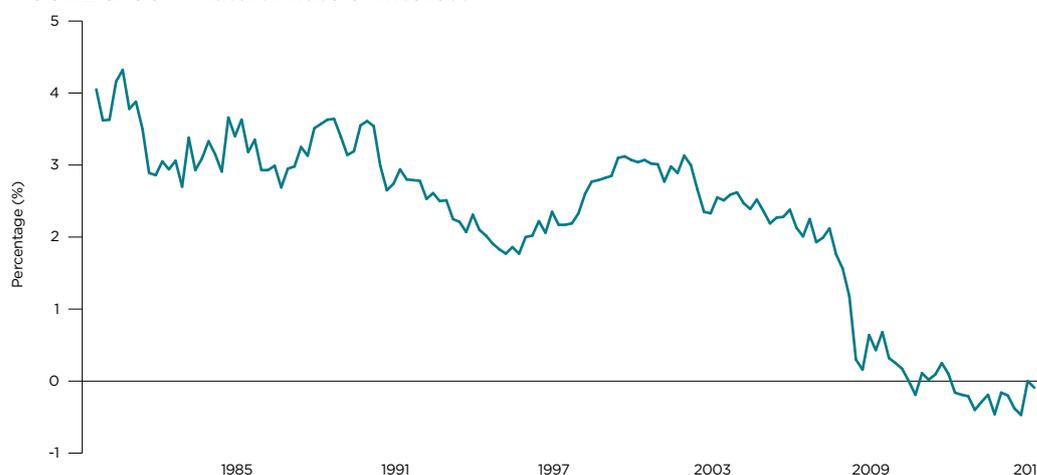
 * One-sided estimate from Laubach and Williams (2003)

Source: Laubach and Williams (2003).

On one hand, the estimated low, and slightly negative, level of the NRI since 2007 provides some support for the demand-side secular stagnation hypothesis. On the other hand, given a positive inflation rate, albeit one that may be below the US Federal Reserve's inflation goal, the NRI has remained above the real policy rate since 2007. Moreover, the speed and timing of the estimated fall in the NRI during the GFC suggests cyclical factors have been more important than the longer-term forces emphasised in the secular stagnation hypothesis.

While estimates of the NRI are subject to uncertainty, other measures of interest rates closely related to the NRI, such as real risk-free rates (i.e. short term policy rates and yields on long-term bonds issued by the governments of the major advanced economies), have also declined substantially since the 1990s (Figure 4). Indeed, Summers (2014a) argues that this decline in market interest rates has been the outward sign of a declining NRI. Nonetheless, a large part of the decline, especially in the longer-term real interest rates, also occurred during the GFC.

FIGURE 4: Advanced Economies — Real Interest Rates*

Short-term

Long-term

— US   — Japan   — Euro area**

— US   — Japan   — Germany
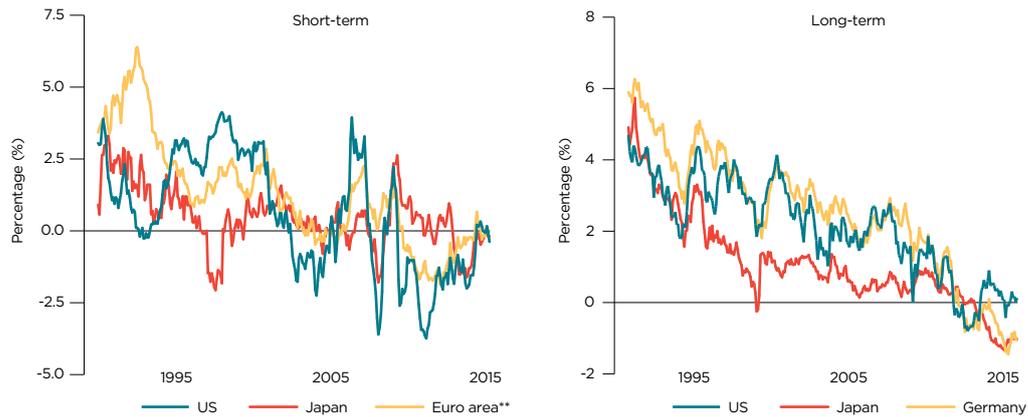
* The short-term real interest rate is calculated as the policy rate less headline inflation. The long-term real interest rate is calculated as the 10-year nominal government bond yield less expected 10-year inflation from Consensus Economics.

** Euro area before 2000 is Germany.

Sources: Bloomberg, RBA, Thomson Reuters.

Has potential GDP growth declined?

As shown in Figure 1, estimates of potential GDP have been revised significantly lower over the past 10 or so years for the United States, euro area and Japan. The estimated growth rate of potential GDP has also declined. A recent study by the International Monetary Fund (IMF 2015a) found that the persistent slowdown in potential GDP growth for advanced economies predates the GFC. Applying a production function approach to estimating potential GDP growth, the study separated growth into its three key components: labour input; capital input; and productivity. Potential output growth in advanced economies appears to have declined due to a decline in productivity growth, both before and after the GFC, and a decline in labour input as a result of demographic factors, which has played a bigger role after the GFC (Figure 5).[7]

FIGURE 5: Advanced Economies — Potential Output Growth

— Potential output growth   ▊ TFP growth   ▊ Potential employment growth   ▊ Capital growth
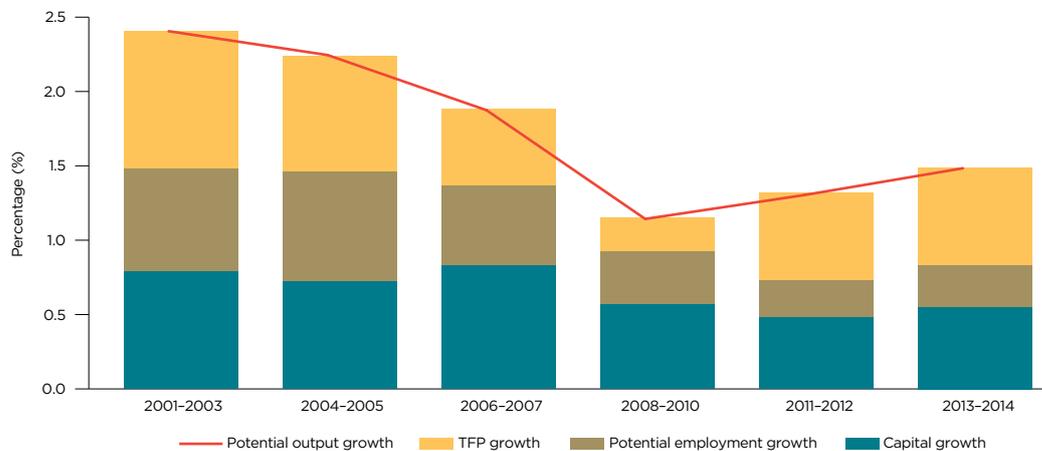
Source: IMF.

Examining the key factors behind secular stagnation

The natural rate of interest is determined by the balance of savings and investment preferences. By definition, global savings and global investment should equal each other. An excess supply of desired savings relative to the demand for desired investment will result in a lower NRI to achieve this balance.

Both the demand-side and supply-side versions of the secular stagnation hypothesis highlight changing demographic trends, particularly the declining rate of population growth, as a key factor behind the decline in the NRI and the decline in potential GDP growth.[8]

On the savings side, the life-cycle theory of savings and consumption suggests that an individual's propensity to save varies over their lifetime, such that their savings rate is lower when they are young, increases as they approach the end of their working life, and declines again following retirement. This implies that the age structure of the population is likely to affect the overall level of savings in an economy. The share of prime age savers (those aged between 25 and 60) in the global population has been increasing steadily since the early 1970s (Figure 6). This increase has been faster than the increase in the elderly (those aged over 60) share of the population. As a result, the difference between the two age groups, which should determine the pressure on savings supply, has been increasing steadily over the past 25 years and has been projected to peak in 2015.[9]

FIGURE 6: Demographic support for savings
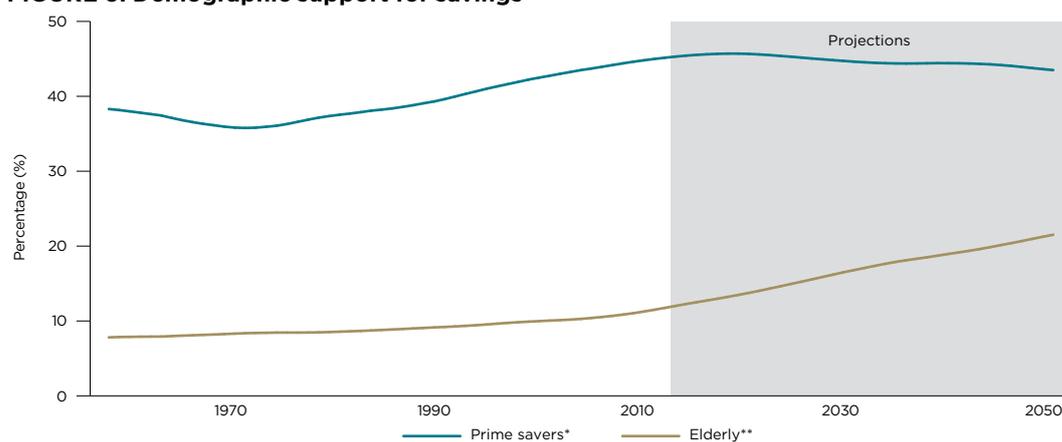
*   Population aged between 25 and 59. Data from the National Transfer Accounts indicates that this is approximately the age group among which labour income exceeds consumption.
** Population aged 60 and over.

Source: UN Population Division.

Most of the growth in the working-age population has occurred in emerging market economies, and this goes some way towards explaining the excess savings in these economies (Figure 7).[10] The increase in emerging market savings came mainly from China and oil-exporting countries. The IMF suggests that the key drivers of this have been the erosion of the family based safety net and the underdeveloped social safety net in China, financial constraints, demographic factors, the desire to accumulate substantial buffers of official reserves, and, in particular, the steady increase in their growth rate (IMF 2014).

Both the demand-side and supply-side versions of the secular stagnation hypothesis highlight changing demographic trends, particularly the declining rate of population growth, as a key factor behind the decline in the NRI and the decline in potential GDP growth.

FIGURE 7: Savings and investment
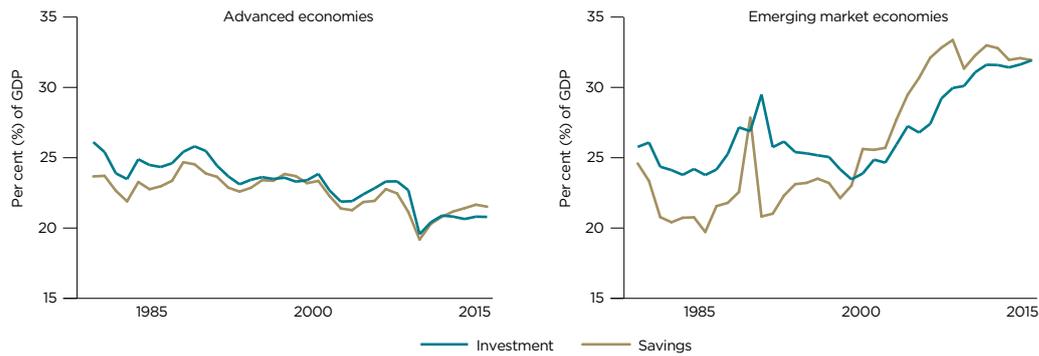
Source: IMF.

Some of these emerging market savings found their way to advanced economies. In particular, savings have flowed to advanced economies in the form of purchases of 'risk-free' assets such as advanced economies' government bonds or closely rated assets, through the accumulation of large foreign exchange reserves (Bernanke 2005, 2011). A number of studies have concluded that the decline in real government bond yields in advanced economies before the GFC largely reflects the build-up in emerging market savings between the late 1990s and 2007 (see, for example, IMF 2014). Pescatori and Turunen (2015) found that the increase in excess global savings, measured by the current account surpluses of emerging market economies, explains a significant part of the decline in the US NRI since the early 2000s.

In most advanced economies, the growth rate of the working age population, defined here as those aged between 15 and 64, has been slowing (Figure 8). In the case of Japan, the working-age population has been declining since 1995, and it has been declining in the euro area since 2010. While the working age population is still growing in the United States, the growth rate is quite low relative to its history and is projected to decline further. The slower growth in the working age population translates into slower growth of the labour force assuming that age-specific and gender-specific participation rates do not increase to offset the decline.

FIGURE 8: Working Age Population Growth*
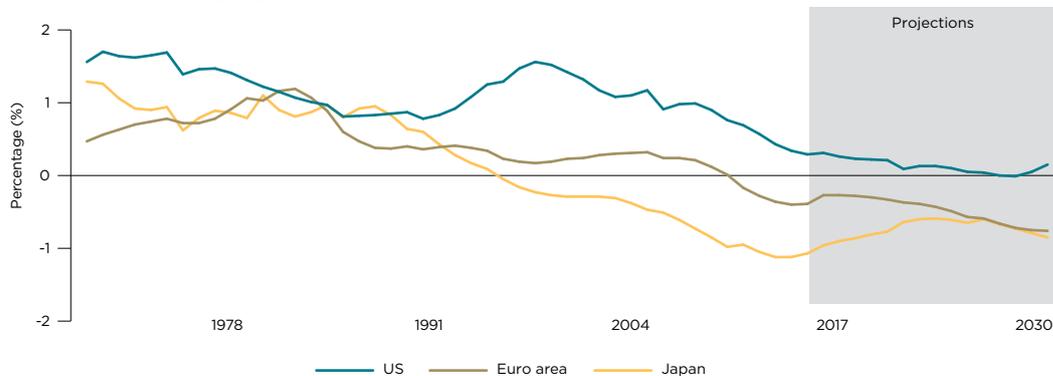
* Working age population is 15 to 64 years old.

Source: UN Population Division.

These trends in advanced economies could be expected to lead to lower investment demand because a slower growing, or even declining, workforce requires less machinery and other equipment if the capital-to-labour ratio remains constant. However, if production processes become more capital intensive in response to the slowing labour force growth, the effect on investment is ambiguous.

Another secular factor affecting desired investment growth is the decline in the relative price of capital goods. Between 1980 and 2007, the prices of capital goods relative to overall prices in the largest advanced economies declined by between 20 and 30 per cent, which means that a given level of nominal savings can purchase more physical capital than was previously the case, leading to a fall in nominal investment spending. While the effect of lower prices of capital goods could be offset by an increased volume of investment, the price effect appears to have been more important thus contributing to a decline in investment demand (IMF 2014).

The GFC is also likely to have had a significant and long-lasting effect on private investment. A number of studies find such hysteresis effects after a financial crisis (see, for example, IMF 2014), however, the extent to which the post-GFC experience is consistent with prior episodes remains an area of debate. The IMF (2015b) argues that the overall weakness in economic activity has been the primary reason for the weakness in business investment, and that business investment has deviated little from what can be expected based on historical precedent. Other studies support this view although they emphasise the importance of tighter financial conditions and heightened uncertainty (see, for example, Lewis et al. 2014).

FIGURE 9: Ratio of Capital Goods Price Index and GDP deflator
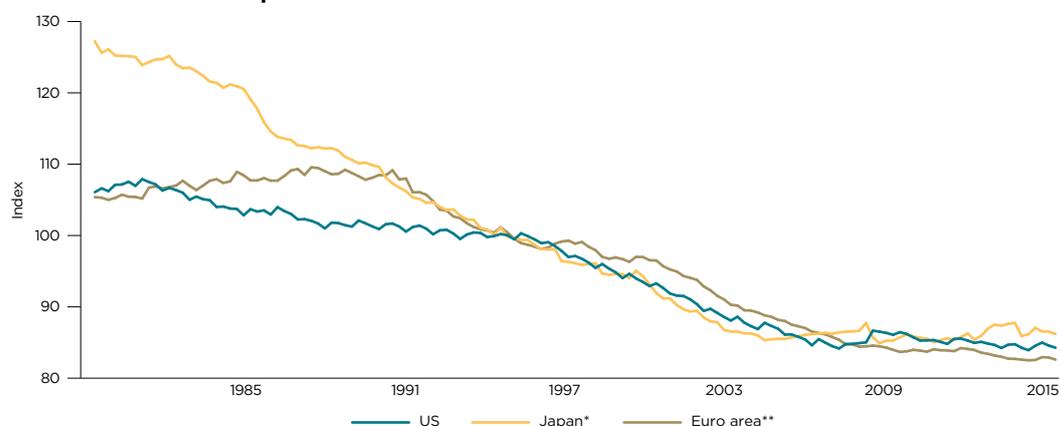
* Uses domestic capital goods index.

** Euro area data is available from 1995 onwards. For earlier periods, data for Germany is used instead.

Source: Thomson Reuters.

As a result of the lower investment growth, whatever its cause, the growth of the capital stock in advanced economies has declined since the GFC (Figure 10). In some of these economies, notably Japan but also the euro area, the slowing in the capital stock growth started much earlier. The IMF (2015a) also attributes some of the decline in potential growth in advanced economies in recent years to the effect of the GFC on investment, and therefore capital growth.

Another important consideration for the secular stagnation hypothesis is that total factor productivity (TFP) growth has been declining in some of the largest advanced economies for over a decade, substantially subtracting from their potential GDP growth rate (Figure 10). According to Gordon (2012, 2015) the ICT revolution, unlike earlier technological advances, provided only a short-lived boost to productivity growth. Fernald (2014) also argues that the exceptional boost to US productivity growth from the ICT revolution in the late 1990s and early 2000s had vanished by the mid-2000s. He notes that the decline in productivity growth predated the GFC and that the productivity slowdown was in sectors producing or intensively using information technology.

Figure 10: Capital Stock and Productivity Growth
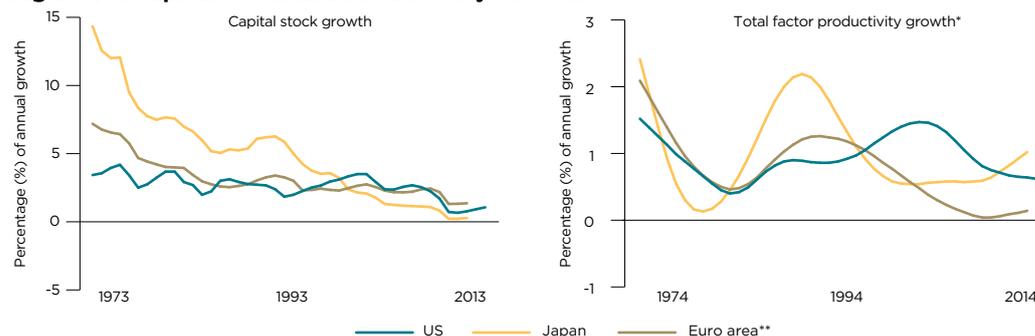
* HP filtered, with smoothing parameter set to 100.

** Euro area capital stock growth is growth in the aggregate capital stock in France, Germany, Italy and Spain.
    Total factor productivity growth in the euro area is the simple average of the growth rates in France, Germany, Italy and Spain.

Sources: BLS, OECD, Penn World Tables.

The future evolution of productivity remains a key uncertainty in the outlook for potential growth and for understanding whether its decline has been secular. 'Techno-pessimists' expect the productivity slowdown to be persistent, arguing that future innovations will not boost productivity growth as much as previous innovations did (see, for example, Gordon 2012). On the other hand, 'techno-optimists' argue that technological advances in such fields as computing, medical technology and robotics will outpace the declining contributions of capital and labour to potential output growth (Mokyr 2014).

Conclusion

Secular stagnation, either demand-side or supply-side, is one possible explanation for the recent economic performance in advanced economies. However, there are a number of alternative explanations that emphasise less secular developments. For example, building on extensive work on the pattern of economic recoveries after deep systemic financial crisis, Rogoff and Lo (2015) argue that debt overhang explains the sluggish growth since the end of the GFC. In their view, the remaining post-GFC debt overhang (including public, household, corporate, financial and external debt) might be continuing to impede the recovery through a prolonged negative feedback loop between debt overhang, deleveraging and growth.

Ultimately, it is too early to be conclusive about whether the major advanced economies are experiencing secular stagnation. Estimates suggest that the natural rate of interest has fallen, particularly through the GFC period, but it is not clear that this is acting as a binding constraint on monetary policy. The long-term forces of demographic change are consistent with an increase in desired savings relative to desired investment in the lead-up to the GFC but, as the global population ages, it is likely that these forces will work in the opposite direction. The nature of technological progress and its implications for desired investment and productivity growth will also play an important role in determining whether lower growth is cyclical or more structural.

Ben Bernanke has also argued that US economic recovery had been held back by severe headwinds from the GFC that had precluded what could have otherwise been a stronger cyclical recovery (see, for example, Bernanke 2012). These included: the slow recovery in the housing market due to tightening in credit standards, high incidence of negative housing equity, and the substantial overhang of foreclosed properties; tighter credit conditions and increased risk aversion as a result of the GFC; and the tightening in fiscal policy after the expansionary impulse during the GFC. Similarly, Hamilton et al. (2015) argue that the disappointing post-2008 recovery is better explained by protracted but ultimately temporary headwinds from the housing supply overhang, household and bank deleveraging, and fiscal retrenchment, and, as these headwinds abated in early 2014, US growth has picked up to above its potential rate. Moreover, they argue that the evidence of demand-side secular stagnation was occurring before the GFC is not consistent with the US unemployment rate falling below its neutral level.

Ultimately, it is too early to be conclusive about whether the major advanced economies are experiencing secular stagnation. Estimates suggest that the natural rate of interest has fallen, particularly through the GFC period, but it is not clear that this is acting as a binding constraint on monetary policy. The long-term forces of demographic change are consistent with an increase in desired savings relative to desired investment in the lead-up to the GFC but, as the global population ages, it is likely that these forces will work in the opposite direction. The nature of technological progress and its implications for desired investment and productivity growth will also play an important role in determining whether lower growth is cyclical or more structural.

Notes

1. The authors of this article are Ivailo Arsov and Ashvini Ravimohan, who work in the Economic Analysis Department at the Reserve Bank of Australia. Views expressed here are those of the authors and do not necessarily represent the views of the Reserve Bank of Australia.

2. Teulings and Baldwin (2014) provide an extensive collection of original articles on secular stagnation. This article draws heavily on that work.

3. Haldane (2015) provides a comprehensive review of economic growth, placing the recent performance in the context of the historical experience.

4. The zero lower bound may be less binding in practice. A number of central banks – including in Sweden, Switzerland, the euro area and Japan – have recently introduced negative interest rates on central bank deposits.

5. The labour force participation rate in the United Stated declined from around 66 per cent in 2007 to around 63 per cent in 2015. Most analysis of this decline finds that it is primarily due to the population ageing and other structural factors (Aaronson et al 2014). Population aging has been exerting even greater downward pressure over this period on the participation rates in Japan and euro area.

6. The Laubach and Williams (2003) model imposes relatively few restrictions. It specifies the NRI as a linear function of potential GDP growth and other unobserved but persistent determinants (modelled as a random walk). It also models the output gap (the difference between actual and potential GDP growth) as a function of: the lagged output gap; the lagged rate gap (the difference between actual real policy rate and the NRI); and a Phillips curve that relates inflation to its own lags, the lagged output gap and imported price inflation. The coefficients of these equations, the NRI and the potential GDP growth rate are estimated simultaneously using a multivariate Kalman filter. The results reported here are from the one-sided estimates from the model.

7. In contrast, the same IMF study found that potential output growth in emerging market economies only declined after the GFC, and is expected to fall further in the medium term as these countries approach the technological frontier.

8. Some, including Summers (2014a, 2014b), have argued that increasing income inequality in advanced economies may have increased desired savings as higher-income households tend to have higher saving rates (for example, on the empirical relationship between relative household income and savings rates, see Dynan et al. (2004)).

9. Increased life expectancy would also lead to an increase in desired savings as households need to accumulate wealth to fund a longer retirement period. For example, since 1960, worldwide average life expectancy at birth has increased by around 20 years.

10. Working-age population growth has slowed in some of the larger emerging Asian economies more recently. In the case of China, where the decline in working-age population growth has been very steep, there may be further scope for urbanisation to offset some of these effects.

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MOMENTUM CRASHES:
The Australian evidence

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Previous studies report that significant alpha can be generated in various international equity markets by employing a momentum strategy — i.e. buying past winners and short selling past losers. However, the strategy sometimes crashes, generating large negative returns over one or more consecutive months. Using Australian data, this study generally confirms recent US findings that these crashes tend to occur following steep market declines and are characterised by large positive returns by the past Loser portfolio rather than large negative returns by the past Winner portfolio. This paper also identifies significant risk changes to a momentum strategy in bear markets but, unlike the US study, it does not find the strategy to exhibit option-like behaviour at the time of a momentum crash.

There is strong evidence of momentum in equity markets. Jegadeesh and Titman (1993) provided the first comprehensive study of momentum effects in which, using US stock returns, they demonstrated that portfolios created on the basis of prior three-to-12-month returns experienced continuation of prior high and low returns over the subsequent 12-month period. Subsequent studies have confirmed the existence of this phenomenon in other markets. For example, Fama and French (2012) find momentum for the period November 1989 to March 2011 in stock returns for three of the four regions (spanning 23 countries) they examine: North America; Europe; and Asia Pacific. In their study momentum is not evident in Japan. Asness et al. (2013) also find evidence of momentum across various international markets extending their analysis to the early 1970s and beyond portfolios of stocks to equity index futures, currencies, government bonds and commodity futures.

The Australian equity market has been the subject of a number of momentum-related studies.[1] One of the most notable features of the momentum effect in the Australian market is its prevalence among large stocks.

Vanstone et al. (2012) focus exclusively on top 100 (S&P/ASX 100) stocks in their article in *JASSA, The Finsia Journal of Applied Finance*, finding that over the 2000–11 period a portfolio of top 100 winners outperforms top 100 losers by an average of 1 per cent per month and the S&P/ASX 100 Index by 0.45 per cent per month. More recently, Vanstone and Hahn (2015) find evidence of a strong momentum effect among the S&P/ASX 200 constituents. The presence of momentum among large cap stocks makes this an anomaly which is potentially exploitable by institutional investors. While I am not aware of any Australian momentum funds currently available to investors there is a growing number of US-based mutual funds and exchange-traded funds (ETFs) that employ a momentum strategy. For example, both the AQR Large Cap Momentum Style Fund and the iShares MSCI USA Momentum Factor ETF have accumulated around US$1bn in assets. Vanstone and Hahn (2015) estimate that up to $1.5bn funds under management by listed funds is 'potentially attributable to momentum in Australia' (p. 21), and that some unlisted funds are also likely to employ momentum.

While the long-run evidence of high returns to a momentum strategy is compelling, recent research by Daniel and Moskowitz (2014) has focused on the 'infrequent and persistent strings of negative returns' (p. 1) associated with momentum. They refer to these events as *momentum crashes* which occur in a sharp recovery subsequent to large market declines and when volatility is elevated. Using US data from 1926 to 2013, they identify two periods when the momentum strategy significantly underperforms. The first is from June 1932 to December 1939, and the second is from March 2009 to March 2013, which appears to coincide with the endpoint in their sample.

The driver of this underperformance is the significant outperformance of prior losers, the short side of the momentum strategy and, to a lesser extent, the underperformance of prior winners, the long side of the strategy. Both of these periods follow notable market declines, the first prefaced by the 1929 stock market crash and the second by the global financial crisis (GFC). The two months which represent the bottom of each of these stock market crashes are June 1932 and March 2009. July and August 1932 are the two worst months for the momentum strategy in the entire sample, generating returns of −60.98 per cent and −74.36 per cent. March and April 2009 are the seventh worst and fourth worst months with returns of −42.28 per cent and −45.52 per cent. These returns are almost entirely driven by the short side of the strategy, with the past losers in 1932 returning 232 per cent in July and August and the long side (past winners) returning 32 per cent. Similarly in 2009, the past losers recorded returns of 163 per cent in March to May whereas the past winners managed just 8 per cent. So the crash in momentum returns is a product of the short portfolio crashing up rather than the long portfolio crashing down. Daniel and Moskowitz (2014) identify significant risk changes in momentum portfolios during bear market periods and contend that these risk changes cause the momentum portfolio to behave like a written call option over the market during these periods.

My aim here is to document the occurrence, if any, and nature of market crashes in Australian equity returns and to determine whether the momentum portfolio here also exhibits option-like behaviour. From an academic perspective it is important to ascertain whether phenomena documented in the world's largest equity market is present in other developed markets, thereby creating greater confidence that these crashes have some systematic driver and do not occur by chance.

So the crash in momentum returns is a product of the short portfolio crashing up rather than the long portfolio crashing down. Daniel and Moskowitz (2014) identify significant risk changes in momentum portfolios during bear market periods and contend that these risk changes cause the momentum portfolio to behave like a written call option over the market during these periods.

Practitioners here in Australia may also benefit from being aware of evidence on how the momentum strategy performs in times of great market stress, and from being able to modify the strategy to reduce underperformance in these situations. While there are few, if any, overt momentum funds in Australia, Vanstone and Hahn (2015) suggest that momentum may be the driver of a number of listed and unlisted funds.

Data and portfolio construction

This study employs the Sirca SPPR database which contains return data for Australian Securities Exchange (ASX) listed companies from January 1974 to December 2014. Using this data, decile portfolios are constructed each month beginning at the end of December 1974 and ending November 2014. The portfolios are value weighted and the portfolio comprising the highest 10 per cent of returns is dubbed the Winner portfolio and the portfolio with the lowest 10 per cent of returns is called the Loser portfolio. The portfolios are constructed based on realised returns from two months prior to the current month to 12 months prior to the current month. To maintain consistency with previous literature, the one-month gap between the ranking period and the portfolio construction date is to avoid the short-term reversal documented by Jegadeesh (1990). For example, the portfolios created at the end of December 1974 are based on realised returns from the end of December 1973 to the end of November 1974. Then, the return that is measured here is for January 1975.

To be included in the sample, companies are required to have a valid price on the last day of the month two months ago, 12 months ago and on the portfolio formation date. Following Daniel and Moskowitz (2014), each company must have at least eight valid returns over the prior 11-month period. Only 'ordinary' shares are included in the sample.

Each month, the prior 11-month returns are ranked from highest to lowest with the highest 10 per cent of returns allocated to the past Winner portfolio, the next 10 per cent to the next portfolio and so on until the lowest 10 per cent of returns are assigned to the past Loser portfolio. Portfolios are value-weighted, held for one month after the construction date and the value-weighted return calculated for that one month. The process is repeated for each of the 480 months in the period. The momentum strategy requires a long position in the past Winner portfolio and a short position in the past Loser portfolio. The return to the momentum strategy (WmL)[2] is the difference between the Winner portfolio return and the Loser portfolio return. For example, in calendar year 2010 the Winner portfolio returned 32.9 per cent and the Loser portfolio returned 12.8 per cent, so the return to the strategy for 2010 was 20.1 per cent. The focus here is on periods in which the momentum strategy does particularly badly or crashes.

Australian momentum crashes

First, let's reaffirm, in general terms, the previously documented performance of the momentum strategy. For the full 40-year sample period, Table 1 shows that the Winner portfolio returned a compound average annual return of 21.6 per cent compared to a negative 11.6 per cent return for the Loser portfolio and 13 per cent for the entire market.[3] The momentum strategy or WmL returned 33.2 per cent per annum. It is important to reiterate that the Winner and Loser portfolios are constructed on the basis of past returns and the returns in Table 1 show the return achieved after the construction date by investing in these portfolios. These returns, however, do not take into account transaction costs that with monthly portfolio reformation would be high, particularly in the early part of the sample when brokerage rates were regulated.

Table 1 also shows that the momentum strategy performs strongly when the 40-year period is divided into four 10-year periods. Also, in the most recent three of the periods, the momentum performance is driven by both the long and short side whereas in the first period it is principally the driven by the long side.[4]

TABLE 1: Average annual compound returns

Period	Winner	Loser	WmL	Market
1975–2014	21.6%	–11.6%	33.2%	13.0%
1975–1984	28.0%	12.2%	15.7%	19.0%
1985–1994	16.8%	–13.7%	30.4%	14.3%
1995–2004	23.1%	–23.9%	47.0%	11.8%
2005–2014	18.9%	–17.4%	36.2%	7.3%

Note: The Winner and Loser portfolios are constructed based on past returns from one month to 12 months prior to the portfolio formation date. The Winner portfolio comprises the highest 10% of returns and the Loser the lowest 10% of returns. The Winner and Loser returns are the average annual compound returns from investing in these portfolios constructed on past returns and holding them from one month before reforming each portfolio. The momentum strategy or WmL return is the Winner return minus the Loser return.

Table 2 lists the worst 15 months for the Momentum strategy, with the worst month being April 2000. It is interesting to note that neither April 2000 nor any other month in 2000 appears in the list of the worst 15 monthly returns reported by Daniel and Moskowitz (2014) using US data. Of the 15 worst months in the Daniel and Moskowitz (2014) study, seven occur in the 1930s which pre-dates the available ASX data here. A notable overlap between the Australian and US results is the first month following the market bottom in early 2009 with April appearing on both lists. Here, April 2009 is the second worst month with minus 37.8 per cent to the Momentum strategy. In the US, this month also ranks second (after removing the 1930s period) but performs worse with −44.5 per cent. The other notable overlap is the two months (October and November 2001) following the market slump in the wake of the 11 September 2001 terrorist attacks on US soil.

TABLE 2: Worst 15 months for Momentum strategy

Year	Month	Single Month Return				Prior 2 year Return		
		Winner	Loser	WmL	Market	Winner	Loser	Market
2000	4	–42.2%	–0.5%	–41.6%	–1.7%	212.0%	–28.7%	21.5%
2009	4	4.3%	42.1%	–37.8%	6.5%	–12.6%	–72.0%	–35.7%
1982	8	–1.1%	32.6%	–33.7%	4.1%	–27.7%	–62.1%	–19.0%
1991	2	7.7%	34.5%	–26.8%	7.4%	–26.1%	–77.1%	–0.1%
1993	5	10.6%	34.7%	–24.1%	4.0%	47.9%	44.8%	20.3%
1991	7	7.2%	28.2%	–21.0%	4.0%	–14.4%	–84.2%	9.6%
1983	9	–10.7%	10.2%	–20.9%	2.6%	94.6%	–16.3%	24.9%
2003	8	8.6%	29.1%	–20.5%	3.6%	52.6%	–53.6%	5.2%
2009	5	0.0%	20.2%	–20.2%	2.3%	–16.7%	–62.5%	–33.6%
1980	12	–17.5%	2.5%	–20.0%	–2.5%	332.8%	74.1%	143.9%
1980	3	–24.5%	–4.8%	–19.7%	–12.6%	233.1%	121.2%	137.7%
1991	9	3.5%	22.8%	–19.3%	1.7%	–20.0%	–87.0%	–3.1%
2001	11	2.9%	21.6%	–18.6%	3.3%	–13.0%	–75.0%	20.3%
1998	9	2.1%	20.2%	–18.1%	3.6%	40.9%	–52.9%	18.0%
2001	10	3.4%	21.0%	–17.6%	6.2%	–10.2%	–80.8%	13.2%

Notable among the worst months in Table 2 is the tendency for the bad month to be driven by a strong positive return on the short side of the strategy, rather than a large negative return on the long side of the strategy. A clear exception to this is the worst monthly return in April 2000 where the long-side loses 42.2 per cent and the short-side loses just 0.5 per cent.

April 2000 was at the heart of the tech stock 'crash' in the US when the NASDAQ lost 15.6 per cent of its value. While it made headline news at the time, this event had a limited impact on the broader market in the US and in Australia. Table 3 lists the largest 10 stocks by market capitalisation in the Winner portfolio constructed at the end of March 2000. Nine of the 10 stocks are technology stocks and experienced extremely large returns over the prior year along with a significant decline in April 2000.

TABLE 3: Ten largest Winner portfolio stocks by market cap, as at 31 March 2000

Company	Sector	Mkt Cap ($m)	Prior 12mth Return	April 2000 Return
ERG	Technology	2,343.04	591%	–29%
Davnet	Technology	1,773.12	1330%	–55%
GES International	Technology	1,248.05	858%	–32%
Sausage Software	Technology	822.03	646%	–51%
Securenet	Technology	820.19	836%	–59%
Keycorp	Technology	612.66	306%	–48%
New Tel	Technology	356.12	627%	–61%
Voicenet	Technology	355.65	755%	–33%
Revesco	Healthcare	314.35	290%	–21%
Senetas Corporation	Technology	276.77	2751%	–67%

The second worst month in Table 2 is April 2009, the month immediately following the GFC market bottom. In April 2009 the momentum strategy lost 37.8 per cent but this was mainly driven by the short side of the strategy, the Loser portfolio earning 42.1 per cent. The Winner portfolio earned a relatively small positive return of 4.3 per cent slightly underperforming the broad market return of 6.5 per cent. The momentum crash of early 2009 ran from March 2009 to September 2009 with monthly momentum returns through that period of –17.4 per cent, –37.8 per cent, –20.2 per cent, –11.2 per cent, –7.0 per cent, –8.2 per cent and –2.0 per cent as depicted in Table 4. $10,000 invested in the momentum strategy at the end of February 2009 would have been worth just $3,045 at the end of September 2009. Throughout this period it is the short side of the strategy driving the crash. While the long side underperforms the broader market it still generates a 29 per cent return over the period to the end of September. The short side, however, inflicts the damage generating a loss of 77.7 per cent as the share price of the stocks underlying the Loser portfolio soars.

TABLE 4: Profile of the 2009 Momentum crash

Year	Month	Winner	Loser	WmL	Market
2009	3	1.9%	19.3%	–17.4%	7.4%
2009	4	4.3%	42.1%	–37.8%	6.5%
2009	5	0.0%	20.2%	–20.2%	2.3%
2009	6	2.0%	13.1%	–11.2%	3.2%
2009	7	6.5%	13.5%	–7.0%	7.6%
2009	8	5.8%	14.1%	–8.2%	6.1%
2009	9	5.4%	7.4%	–2.0%	5.5%

Table 5 lists the largest 10 stocks by market capitalisation in the Loser portfolio created at the end of March 2009. These stocks had experienced declines over the prior year of 85 per cent or greater and the table illustrates that many of these stocks rebounded strongly in April 2009.

TABLE 5: Ten largest Loser portfolio stocks by market cap, as at 31 March 2009

Company	Mkt Cap ($m)	Prior 12mth Return	April 2009 Return
Minara Resources	467	–93%	45%
Australand Property	467	–86%	60%
Futuris Corporation	291	–85%	23%
Murchison Metals	273	–85%	48%
Ausenco	263	–86%	23%
Sunland Group	194	–86%	–7%
Boart Longyear	188	–95%	–4%
Alesco Corporation	184	–89%	100%
Lynas Corporation	131	–88%	55%
NRW Holdings	129	–88%	51%

Market risk changes and crashes

Daniel and Moskowitz (2014) note that momentum crashes tend to occur following a poor two-year period for stock returns, when stocks in the Loser portfolio have often experienced significant declines and many are at risk of bankruptcy and may offer option-like payoffs. The second column from the right in Table 2 does indicate that in many cases the Loser portfolio has suffered significant losses in the two-year lead-up to a momentum crash, but this is not the case with broad market returns.

Daniel and Moskowitz (2014) present evidence that the market beta of the momentum portfolio falls significantly in bear markets and falls even further in up-market months during a bear market, and it is this which drives momentum portfolio crashes.

Here, I will examine the risk characteristics of the Australian momentum portfolios to assess whether a similar dynamic is at work. Table 6 presents descriptive statistics indicating that the Loser, Winner and Winner-minus-Losers (WmL) portfolios have a significantly higher standard deviation of excess returns than the broader market. A simple market model regression is used to estimate the market beta of each portfolio:

$$R_{WmL,t} = \propto_0 + \beta_0 R_{m.t} \tag{1}$$

where $R_{WmL,t}$ is the WmL return in month t, and $R_{m.t}$ is the Sirca SPPR value-weighted market return for month t.

The betas of the Loser and Winner portfolios are also similarly elevated leaving the beta of the WmL portfolio close to zero. This differs from the US results reported by Daniel and Moskowitz (2014) where the Loser portfolio beta is very high, the Winner portfolio is close to 1 and WmL is –0.54. While there is some evidence of greater negative skewness in returns for the Winner portfolios, there is very little skewness in the WmL portfolio unlike the highly negatively skewed returns reported by Daniel and Moskowitz (2014).

TABLE 6: Portfolio descriptive statistics

	Loser	2	3	4	5	6	7	8	9	Winner	WmL	Market
$r - r_f$	-13.7%	-9.2%	-7.1%	-0.1%	1.4%	6.0%	6.4%	10.1%	10.9%	16.3%	22.4%	6.1%
σ	35.8%	30.1%	25.4%	22.0%	19.0%	18.9%	18.1%	19.2%	22.2%	28.3%	35.1%	15.9%
Sharpe Ratio	-0.38	-0.31	-0.28	-0.01	0.07	0.32	0.35	0.53	0.49	0.57	0.64	0.38
Skewness	0.25	-0.50	-0.92	-0.47	-0.51	-1.02	-0.96	-1.08	-0.78	-0.77	-0.28	-1.64
α	-21.3%	-16.3%	-14.0%	-6.2%	-4.5%	-0.1%	0.4%	3.8%	3.9%	8.3%	22.2%	0.0%
$t(\alpha)$	-4.71	-4.45	-4.95	-2.56	-2.61	-0.06	0.30	2.46	1.98	2.79	4.07	
β	1.27	1.17	1.12	0.99	0.98	0.99	0.97	1.04	1.15	1.30	0.03	1.00

Following Daniel and Moskowitz (2014), I run two further regressions of WmL returns on variations of the market model. Equation 2 adds a bear market indicator to assess if bear markets affect the market beta of the WmL portfolio.

$$R_{WmL,t} = (\alpha_0 + \alpha_B I_{B,t-1}) + (\beta_0 + \beta_B I_{B,t-1}) R_{m.t} \tag{2}$$

where $I_{B,t-1}$ equals 1 if the cumulative Sirca SPPR value-weighted return is negative over the prior two-year period, and equals 0 otherwise.

Equation 3 adds an up-market indicator to see if the occurrence of a positive market return month during a bear market affects beta, thereby confirming the momentum portfolio, in effect, as a written call option on the market.

$$R_{WmL,t} = (\alpha_0 + \alpha_B I_{B,t-1}) + (\beta_0 + \beta_B I_{B,t-1} + \beta_{B,U} I_{U,t} I_{B,t-1}) R_{m.t} \tag{3}$$

where $I_{U,t}$ equals 1 if the current month Sirca SPPR value-weighted return is positive, otherwise zero.

Table 7 presents the results of these tests. Equation 2 largely confirms the findings of Daniel and Moskowitz (2014) that the alpha of the WmL portfolio in bear markets is negative (here it is −1 per cent obtained by adding α_0 and α_B) and that bear markets pull the portfolio beta down 1.05 to −0.81 (obtained by adding β_0 and β_B). While Equation 3 estimates a negative coefficient for $\beta_{B,U}$ it is not statistically significant and so does not support the finding and conclusion of Daniel and Moskowitz (2014) that the WmL portfolio 'exhibits option-like behaviour relative to the market' (p. 15). However, it is worth noting that later in their paper, using a time period similar to that used here, Daniel and Moskowitz (2014) also estimate a statistically insignificant coefficient for $\beta_{B,U}$.

TABLE 7: Impact of market state on beta

Coef.	Variable	Estimated Coefficients (*t*–statistics in parentheses)		
		Regression		
		1	2	3
α_0		0.019	0.025	0.025
		(4.1)	(5.2)	(5.2)
α_B	$I_{B,t-1}$		−0.035	−0.031
			(−2.9)	(−1.6)
β_0	$R_{m,t}$	0.034	0.242	0.242
		(0.4)	(2.3)	(2.3)
β_B	$I_{B,t-1}\ R_{m,t}$		−1.051	−0.931
			(−4.2)	(−1.9)
$\beta_{B,U}$	$I_{U,t}\ I_{B,t-1}\ R_{m,t}$			−0.210
				(−0.3)
R^2		−0.002	0.057	0.055

Table 8 reports the results of running the third regression (Equation 3) on each of the decile portfolios. It is interesting to note the near monotonic change in β_B from positive to negative moving from Loser to Winner and also, more importantly, that the large negative β_B on the WmL portfolio is driven by an increase in the market beta of the Loser portfolio during bear markets rather than a fall in the market beta of the Winner portfolio. Again, though, there is no significance in any of the up-market $\beta_{B,U}$ coefficients across the various portfolios.

TABLE 8: Impact of market state on portfolios beta

Coef.	Variable	Momentum portfolios – regression coefficients (t-statistics in parentheses)										
		Loser	2	3	4	5	6	7	8	9	Winner	WmL
α_0		-0.023	-0.015	-0.012	-0.006	-0.005	-0.001	0.000	0.003	0.004	0.008	0.025
		(-5.8)	(-4.5)	(-4.7)	(-2.8)	(-3.2)	(-0.4)	(-0.3)	(2.4)	(2.2)	(2.9)	(5.2)
α_B	$l_{B,t-1}$	0.031	-0.002	0.001	0.014	0.006	0.006	-0.001	0.006	-0.004	-0.001	-0.031
		(1.9)	(-0.1)	(0.1)	(1.6)	(1.03)	(1.1)	(-0.1)	(1.1)	(-0.6)	(0.1)	(-1.6)
β_0	$R_{m,t}$	1.096	1.043	1.063	0.925	0.925	0.989	0.972	1.053	1.200	1.335	0.242
		(12.4)	(14.4)	(18.8)	(19.3)	(26.9)	(30.3)	(32.8)	(34.2)	(30.7)	(22.3)	(2.3)
β_B	$l_{B,t-1} \, R_{m,t}$	0.852	0.503	0.371	0.634	0.246	0.119	-0.174	0.162	-0.302	-0.087	-0.931
		(2.1)	(1.5)	(1.4)	(2.8)	(1.5)	(0.8)	(-1.3)	(1.1)	(-1.7)	(-0.3)	(-1.9)
$\beta_{B,U}$	$l_{U,t} \, l_{B,t-1} \, R_{m,t}$	0.014	0.280	-0.082	-0.503	0.014	-0.184	0.283	-0.380	0.069	-0.181	-0.210
		(0.0)	(0.6)	(-0.2)	(-1.5)	(0.1)	(-0.8)	(1.4)	(-1.8)	(0.3)	(-0.4)	(-0.3)
R^2		0.367	0.407	0.503	0.525	0.675	0.702	0.734	0.746	0.691	0.544	0.055

Concluding remarks

While a momentum strategy of buying a portfolio of prior winners and selling a portfolio of prior losers has been shown to generate significant alpha in a range of international equity markets, the strategy will infrequently crash generating large losses over a period of several months. In Australia, the most prominent of these crash events ran from March 2009 to September 2009 producing a cumulative loss to the strategy of 78 per cent. Consistent with US research, this GFC crash was driven by high positive Loser portfolio returns rather than high negative Winner portfolio returns, which is likely to be of comfort to asset managers who run long-only momentum funds or who take momentum into account in portfolio construction.

In conclusion, asset managers who employ a (long–short) momentum strategy should be aware that the strategy will infrequently crash, but that these crashes may to some extent be predictable as they tend to follow periods of very large losses to the loser portfolio. Understanding this, and the significant risk changes that occur, potentially offers managers the opportunity to modify the strategy at those times to mitigate losses, at least, or perhaps even generate positive returns.

These results show that during bear market periods, the market beta of the Loser portfolio increases significantly and this goes a long way to explaining the outperformance of the WmL strategy across a bear market and the underperformance or crash of the strategy in up-market months shortly after the end of a bear-market. However, further tests cannot confirm the option-like behaviour of the US implemented momentum strategy at the time of a crash.

In conclusion, asset managers who employ a (long–short) momentum strategy should be aware that the strategy will infrequently crash, but that these crashes may to some extent be predictable as they tend to follow periods of very large losses to the loser portfolio. Understanding this, and the significant risk changes that occur, potentially offers managers the opportunity to modify the strategy at those times to mitigate losses, at least, or perhaps even generate positive returns.

Notes

1. These include: Hurn and Pavlov (2003); Gaunt and Gray (2003); Demir et al. (2004); Durand et al. (2006); Brailsford and O'Brien (2008); Kassimatis (2008); Bettman et al. (2009); Galariotis (2010); O'Brien et al. (2010); Schneider and Gaunt (2012); Vanstone et al. (2012); Doan et al. (2014); Huynh and Smith (2015); and Vanstone and Hahn (2015).

2. The momentum portfolio and WmL are using interchangeably throughout this article.

3. Calculated using the Sirca SPPR value-weighted index of all listed stocks.

4. As is typical in this type of analysis, it has been assumed that any stock in the sample can be short sold. In reality there are regulatory and institutional impediments to short selling, which may mean that not all stocks included in the Loser portfolio could actually have been short sold at that time.

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MISPRICING OF
Australian IPOs

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*Much economic analysis has been undertaken on the well-known anomaly of the
incidence of high returns on the first day that an initial public offering (IPO) is listed.
This study focuses on the Australian market, which is one of the largest markets in
the Asia-Pacific region and has several relevant institutional and regulatory features
different from the US market.*

The price behavior of the Australian IPOs issued during the period from 1995 to 2013 is examined
over three event windows. The first period is the return on the first day, which is typically taken as
a measure of underpricing. The second period examines the price behaviour from the end of the
first day of trading to the end of the 60th day. During this period we see how prices behave over
a period in which US IPOs are supported by their underwriters, which is not the case in Australia
(Ellis et al. 2000). The third period examines the price behavior from the end of the first day to
the end of the 250th day to measure the longer-term performance of IPOs; this has often been
found to be negatively correlated with the first-day performance (Ritter and Welch 2002).

We find a significant positive average abnormal return on the first day of trading which
continues to grow over the first year of trading. This suggests that the market views the average
Australian IPO as being significantly underpriced. However, we also find that the distribution
of the abnormal returns is heavily skewed to the right with only 16 per cent of IPOs realising an
above-average abnormal return. If we repeat our analysis using median returns, the first-day
return is reduced by two-thirds with performance remaining flat over the subsequent 12 months.

Previous studies

There are numerous studies that highlight the high level of underpricing of IPOs in various
markets, although the extent of this seems to differ greatly across markets (Engelen and van
Essen 2010; Autore et al. 2014). The evidence on underpricing in Australia dates back to the
early study by Finn and Higham (1988) who find an average underpricing of 29.2 per cent when
examining 93 IPOs over the period from 1966 to 1978. Subsequently, there have been several
other studies examining different time periods which identify underpricing that ranges from
16.4 per cent (Lee et al. 1996) to 49.8 per cent (How and Howe 2001). Dimovski and Brooks
(2004) find that variation in the extent of underpricing across IPOs is largely explained by
market sentiment, earnings per share yield, offer price and whether the IPO is underwritten.

The general finding is that much of the large first-day returns dissipate over the remainder of
the first year of listing with Mustow (1994) finding an underperformance of 9 per cent over the
remainder of the first year, Lee at al. (1996) finding an underperformance of 13.5 per cent, and
Bayley et al. (2006) finding an underperformance of 14.11 per cent.

Our study

Data

The data for the study were obtained from multiple sources. The list and the listing dates of
1,361 Australian IPOs issued during the 1995–2013 period were identified using the Morningstar
Global Database. The offer prices of the IPOs were obtained from the IPOs' prospectus available
on Thomson One Banker and the Australian Securities Exchange (ASX) websites. We used data
from DataStream on the daily adjusted trading prices of the stocks included in our sample and
in the ASX All Ordinaries Index, which is used as a benchmark for market performance. After
eliminating certain IPOs from our analysis, due to the unavailability of certain data, we were left
with a final sample size of 1,095 IPOs.

TABLE 1: Descriptive statistics

	Mean	St. Dev.	Median	Min	Max
Offer Price ($)	0.516	0.781	0.2	0.2	16.5
Gross Proceeds ($m)	36.631	206.54	6	0.002	4,327.4
Age (years)	5.00	11.11	1.42	0.01	120
Assets ($m)	175.4	3,101.3	1.063	0.000001	95,246
Retained Ownership (%)	57.6	19.8	58.0	0	100

Descriptive statistics for the main variables are reported in Table 1. The average age of the companies in our sample is approximately five years which is much less than the 13.6 years for US IPOs reported by Dolvin and Jordan (2008), and the 17.7 years reported for international IPOs in the study undertaken by Engelen and van Essen (2010). The much lower age reported for Australian IPOs reflects the fact that 448 of our sample companies are less than a year old; 344 of these are mining companies. The gross proceeds raised by each of the sample IPOs vary significantly, ranging from $2,000 (Minotaur Exploration Ltd) to $4.3 billion (Arizona Holdings Ltd). The total money raised by the IPOs over our sample period is $39.9 billion with an average offer size of $36.63 million.

The issuing companies retained 57 per cent of the ownership on average with those companies with the highest proportion of retained ownership being in the hotel industry, and those with the lowest proportion being in the financial sector. Only 37.2 per cent of the IPOs in our sample were underwritten, which is in line with the 38.7 per cent reported by Gygax and Ong (2011), with most of the companies using a fixed price offer to go public rather than book building.

The Australian IPO market is dominated by the mining companies (68.58 per cent of the sample) which, on average, are smaller than the non-mining companies both in offer size and total assets. There is a significant difference between the first-day underpricing of the mining companies (average 35.5 per cent) and non-mining companies (average 3.7 per cent).

Method

For each of our three event windows, the raw returns of our sample IPOs are calculated using Equation (1) with their abnormal returns relative to the returns of the All Ordinaries Index being calculated using Equation (2). The first event window measures the level of underpricing calculated from the first-day closing price and the offer price ($CAAR_1$). The second event window measures the price behavior from the first-day closing price to the 60th day closing price ($CAAR2, 60$). The third event window measures the price behavior from the first-day closing price to the 250th day closing price ($CAAR_{2, 250}$).

$$R_{i,t} = \frac{P_t - P_{t-1}}{P_{t-1}} \qquad (1)$$

$$AR_{i,t} = \frac{P_t - P_{t-1}}{P_{t-1}} - \frac{I_t - I_{t-1}}{I_{t-1}} \qquad (2)$$

where $R_{i,t}$ is the return of stock 'i' over period 't', P_t is closing price of stock 'i' at time 't' and P_{t-1} is the opening price of stock 'i' at time 't–1'. $AR_{i,t}$, the abnormal returns, is the difference between the return on the stock 'i' over period 't' and the return on the market (All Ordinaries) index. I_t is closing value of the market index at time 't' and I_{t-1} is the opening value of the market index at time 't–1'. The average daily market adjusted abnormal returns (AAR_t) for the sample 'n' at time 'T' are calculated using Equation 3:

$$AAR_t = \frac{1}{n} \left(\sum_{i=1}^{n} AR_{i,t} \right) \qquad (3)$$

where AAR_t measures the average abnormal performance on each trading day over the first 250 trading days. The daily cumulative average abnormal returns ($CAAR$) are measured using Equation 4:

$$CAAR_t = CAAR_{t-1}) + AAR_t \qquad (4)$$

The significance of the $CAAR_t$ is ascertained by t-statistics (t_{CAR}) defined in Equation 5, where σ_{CAR} refers to cross-sectional standard deviation of the abnormal returns of 'n' firms at time 't'.

$$t_{CAR} = \frac{CAAR_t}{\sigma_{CAR}/\sqrt{n}} \qquad (5)$$

Findings

The performance of the 1,095 Australian IPOs over each of the three event windows is reported in Table 2. As reported in column 2 of Table 2, the IPOs in our sample are underpriced by 25.51 per cent on average and this first-day return is significant at the 1 per cent level. Thus the underpricing that has been consistently found in studies of Australian IPOs is maintained in our study, with the reported first-day returns well within the range identified in prior studies of Australian IPOs (Lee et al. 1996; Bayley et al. 2006).

TABLE 2: Event study results

	Mean	Skewness	Wtd. Mean	Median
AAR1 (%)	25.51***	4.77	9.43**	8.62
$CAAR_{2,60}$ (%)	0.61	1.52	0.11	–4.14
$CAAR_{2,250}$ (%)	12.05**	1.06	0.01	3.93

Unlike the findings in many previous studies, the initial run-up in the price on the first day of trading is not reversed over the next year of trading (Bayley et al. 2006). Indeed, we see that the typical IPO outperforms the market by approximately 1 per cent over the next 59 days of trading and by 11 per cent over the remainder of the first year of trading. Hence, we find a slight positive correlation between the first-day returns and those over both the next 59 and 249 trading days.

Overall, our findings suggest that investors do very well both from purchasing IPOs when they are issued, holding them for up to the first year of trading, and also purchasing IPOs after they are listed and holding them for at least the first year of trading.

Figure 1 provides a clearer indication of the price behaviour of the IPOs. Here, we see IPOs continuing to perform well in both their second and third days of trading adding in excess of another 1 per cent. However, over the next month, there is a slight correction with the abnormal returns falling by about 2 per cent. The direction of the performance of the average IPO changes again over the remainder of the first year of trading.

Overall, our findings suggest that investors do very well both from purchasing IPOs when they are issued, holding them for up to the first year of trading, and also purchasing IPOs after they are listed and holding them for at least the first year of trading.

FIGURE 1: Plot of cumulative average abnormal returns (CAAR$_{1,250}$)
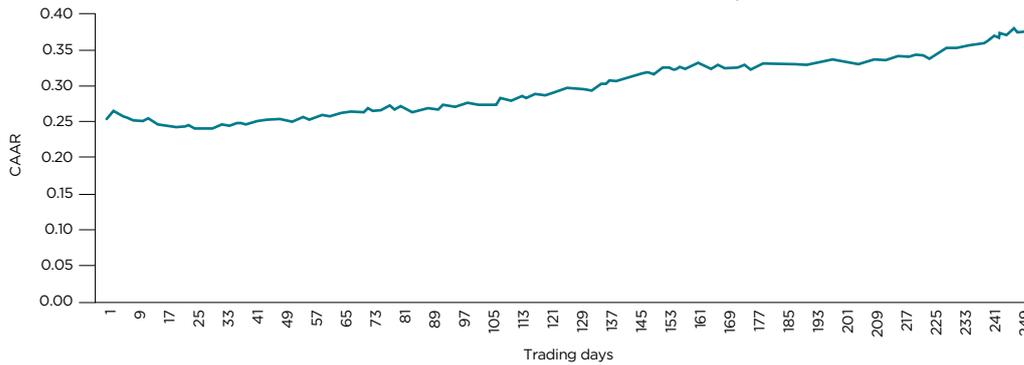
The returns reported in Figure 1 are those that would have been realised from an equal investment in every IPO in our sample. In the fourth column of Table 2, we report the weighted mean which is the return that has been realised on each dollar invested in our sample IPOs. We see that the first-day return as indicated by the weighted mean is 9.43 per cent, which is almost two-thirds less than that indicated by the equally weighted AAR$_1$. The explanation for this significant drop off is that the larger first-day returns are associated with the smaller IPO offerings. Indeed, the CAAR$_1$ for the top quartile of IPOs as measured by the funds raised is 15.93 per cent while that of the bottom quartile is 27.60 per cent. Subsequent to the first day of trading, the weighted means indicate that the returns for the remainder of the first year of trading are almost flat.

One piece of information reported in Table 2 on which we have not commented is the skewness of the CAARs over the three event windows. Where zero indicates no skewness, we see that the CAARs over all of the three event windows are skewed but that this is particularly true for the first-day returns. We see this in Figure 2, which provides a frequency distribution of the CAARs over the three event windows. This brings into question the use of the mean as the measure of central tendency of the first-day returns. Less than one in six IPOs realise an abnormal return of greater than 25.51 per cent (i.e. the mean) on the first day of trading.

The medians are reported in Table 2 for each of the event windows. We see that the median return for the first day of trading is 8.62 per cent which is one-third of the mean and slightly less than the weighted mean. Hence, the level of underpricing of IPOs over our sample period is less than 8.62 per cent in 50 per cent of cases. The median value for the CAAR$_{2,60}$ is −4.14 per cent and for the CAAR$_{2,250}$ is 3.83 per cent. Hence that median abnormal return over the first year of trading is approximately12.5 per cent, which is about one-third of the mean for the same period.

FIGURE 2: Frequency distribution of CAARs
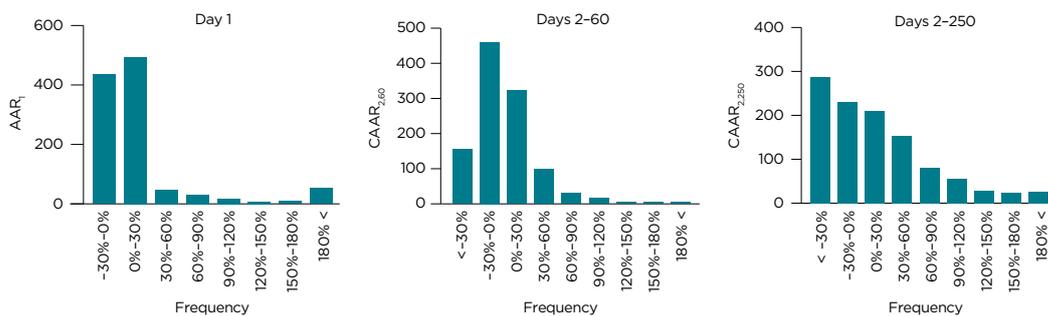
Overall our results suggest that that underpricing of IPOs persists in Australia as the first-day return is not dissipated over the remainder of the first day that the stock is traded. However, we demonstrate that the magnitude of the mispricing is much less than we might be led to believe if we base our assessment solely on the CAARs.

Overall our results suggest that that underpricing of IPOs persists in Australia as the first-day return is not dissipated over the remainder of the first day that the stock is traded. However, we demonstrate that the magnitude of the mispricing is much less than we might be led to believe if we base our assessment solely on the CAARs.

Sub-samples

While the discussion so far has been based on the whole sample we report the performance of important sub-samples in Table 3 to provide further insights into the pricing of IPOs on the Australian market.

TABLE 3: IPO performance by sub-samples

Sub–samples	N	Event Window	Mean (%)	Skewness	Median (%)
Fixed Price	1077	$CAAR_1$	25.50***	4.79	0.86
		$CAAR_{2,60}$	0.44	1.48	–4.23
		$CAAR_{2,250}$	12.36***	1.04	4.32
Book Building	18	$CAAR_1$	26.41	2.66	0.71
		$CAAR_{2,60}$	10.80	2.23	2.92
		$CAAR_{2,250}$	–6.37	1.76	–18.56
Non–underwritten	688	$CAAR_1$	25.60***	4.89	0.94
		$CAAR_{2,60}$	1.42	1.53	–4.51
		$CAAR_{2,250}$	15.88**	1.27	5.10
Underwritten	407	$CAAR_1$	25.37***	4.53	0.63
		$CAAR_{2,60}$	–0.77	1.35	–2.94
		$CAAR_{2,250}$	5.59*	0.31	1.81
Non–mining	344	$CAAR_1$	3.70**	2.57	0.86
		$CAAR_{2,60}$	–1.74	0.72	–2.33
		$CAAR_{2,250}$	7.96*	0.71	2.46
Mining	751	$CAAR_1$	35.51**	3.87	0.86
		$CAAR_{2,60}$	1.68%	1.64	–4.67
		$CAAR_{2,250}$	13.93*	1.17	4.98

Fixed price versus book building

The vast majority of Australian IPOs are issued at a fixed price but the price of many of the larger issues is set after a book building exercise and based on the level of demand elicited particularly from the institutional investors. The underpricing indicated by the first-day returns appears to be fairly similar under both forms of price setting. Again, we find similar results for both fixed price and book building over the longer term with the abnormal return associated with each continuing to rise over the first year of trading. This suggests that there is little difference between the levels of mispricing under each form of price setting.

Again, we see that the CAARs from both types of IPOs are heavily skewed to the right suggesting that the means may overstate the extent of mispricing. The reported medians confirm that this is indeed the case with there even being a suggestion that, in the majority of book-building IPOs, the issue price proves to be higher than the market's view on what the company is worth.

Underwritten versus non-underwritten

The first-day returns on both underwritten and non-underwritten IPOs are very similar. In both cases the abnormal returns over the rest of the first year of trading are positive but they are significantly greater for the non-underwritten issues. Overall, it seems that IPOs are underpriced irrespective of whether or not it is underwritten although the extent of the underpricing is greater in the absence of an underwriter. In both cases, the frequency distributions of the CAARs are heavily right-skewed with this being slightly greater for the non-underwritten issues.

Turning to the medians, we find that the first-day return of the typical IPO is very close to zero. Over the next year, there are slight positive abnormal returns in both instances but these are slightly greater with non-underwritten issues. The conclusion that we draw from the results reported is that the typical IPO is fairly priced with the non-underwritten IPOs perhaps being slightly underpriced.

Mining versus non-mining

About two-thirds of IPOs in our sample are undertaken by relatively small mining companies and we see that the price behaviour of these issues differs from that of the non-mining companies. In the case of the non-mining companies, there is little evidence of underpricing with first-day abnormal returns of about 4 per cent and with slightly negative abnormal returns over the first year of trading. The CAARs are right-skewed and the medians clearly indicate that the typical non-mining IPO is fairly priced. The findings for the mining IPOs are quite different, with initial investors in the typical mining IPO earning a very high first-day return but with the returns being almost flat over the remainder of the first year of trading. The distribution of the first-day returns is heavily right-skewed and a review of the median returns suggests that the typical mining IPO is judged by the market as being fairly priced.

Concluding comments

Based on the average returns across our sample, we find evidence of large underpricing of IPOs consistent with that found in many previous Australian and international studies. We do not find evidence of a large subsequent reversal suggesting that the average Australian IPO is significantly underpriced. However, we also identify that the IPO returns are heavily right-skewed suggesting that the median return might provide a better insight into the pricing behaviour of IPOs.

We find that an analysis of the medians indicates a much lower abnormal return on the first day of trading, which is very similar to that realised on each dollar invested in these new issues. This suggests a much smaller level of underpricing as indicated by price movements on the first day of trading, with little evidence of either positive or negative abnormal returns over the subsequent year.

Based on the average returns across our sample, we find evidence of large underpricing of IPOs consistent with that found in many previous Australian and international studies. We do not find evidence of a large subsequent reversal suggesting that the average Australian IPO is significantly underpriced. However, we also identify that the IPO returns are heavily right-skewed suggesting that the median return might provide a better insight into the pricing behaviour of IPOs.

When we look at subsets of the data, we find little difference in pricing behaviour in the first year of trading between IPOs with fixed pricing, IPOs where the price is set after book-building and those that are underwritten or not underwritten. However, we do find evidence that the underpricing of IPOs is largely restricted to issues made by mining companies with the mining IPOs being reasonably priced.

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SPECIAL SECTION: DIVIDEND IMPUTATION

DIVIDEND IMPUTATION
and the Australian financial system

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There is ongoing debate about the precise effects of the dividend imputation system on the Australian financial sector, company and investor behaviour, and real sector consequences. In discussions about the costs, benefits and the future of imputation, a critical but largely ignored issue is the need to identify the appropriate counterfactual. Any alternative will involve some differences between Australian and overseas tax systems and differential treatment between investors, which will involve various types of distortions. Based on the available evidence, this paper argues that the benefits of imputation outweigh its costs. Moreover, the disruption to financial markets caused by substantive change such as abolishing imputation would be substantial.[1]

International financial market integration and dividend imputation

Much of the uncertainty about the effects of dividend imputation arises from different perspectives on the extent and consequences of global integration of capital markets. While there is little doubt that a high degree of integration exists between the Australian and international capital market, it is important to recognise that the imputation system introduces a 'tax wedge'. Imputation is essentially equivalent to a subsidy to domestic investors in domestic shares or the removal for these investors of the distorting double taxation of dividends in a classical tax system which applies (in various forms) to most international investors (and investments).

There is substantial debate and disagreement on the effects of this tax wedge. Based on different interpretations of relevant theory and empirical evidence, there are technical arguments about its effects on domestic equity market pricing and the cost of equity capital for Australian firms. But the debate plays out most clearly in the context of regulatory access pricing decisions such as by the Australian Energy Regulator. The value attributed to franking credits and incorporated into the 'building block' approach used to determining allowable revenue and prices has multi-million dollar consequences for the return on equity achievable by the companies concerned. The issue of imputation's effects on equity pricing and the cost of capital is considered in some detail in the companion piece in this issue of JASSA by Ainsworth et al., and is not pursued here other than to note the following important points.

First, at polar extremes of the debate are what can be termed the *international integration and domestic segmentation hypotheses*. The former hypothesis implies that the dominance of international investors means that equity prices and thus the cost of equity capital for Australian firms is determined in global markets. The implication is that the benefits of imputation accrue to Australian investors in the form of a higher than required rate of return arising through the tax benefits received. The latter hypothesis implies that domestic investors bid up the price of Australian stocks relative to comparable stocks overseas due to the tax benefits, such that Australian companies benefit from the lower (tax induced) required rate of return of domestic investors for domestic stocks. Either extreme view brings with it a large number of logical conclusions about a range of financial and real phenomena (discussed in the larger paper, see endnote), however, consistent application of one view is not always adhered to by participants in the debate.

Reality is undoubtedly somewhere in between these extremes, but it is worth noting that (often vague) assertions that global integration of capital markets and consequent arbitrage activities must remove scope for international differences in the cost of capital (under the international integration hypothesis) are not well founded. Arbitrage of any price differences between domestic and foreign stocks, resulting from domestic investors pushing up domestic stock prices due to the value placed on imputation credits, is not as simple as it might appear.

The arbitrage strategy involves short selling higher priced domestic securities to purchase similar, lower priced, foreign securities. There are obviously risk issues which make this a form of 'risk arbitrage', but there is a more fundamental impediment to profitable arbitrage. That impediment is the need to borrow securities to enable the short selling. Securities lending arrangements in Australia require the borrower of securities to reimburse the lender for any dividends received, with the reimbursement amount grossed up by the value of franking credits attached to the dividend.

Thus, for example, if there were similar Australian and foreign stocks each about to pay cash dividends of $0.70, and the Australian stock were priced at $10 and the foreign stock at $7, it might appear that buying 10 shares of the foreign stock financed by short selling seven shares of the domestic stock would involve zero current cash flow and generate $7 of dividend revenue (from the 10 foreign shares) and require paying only $4.90 of dividend compensation to the lender of the seven Australian shares. However, the requirement to 'gross up' the amount paid to the stock lender means that $7 in total would have to be paid, removing the arbitrage opportunity. This requirement removes the apparent but illusory gains from a simple arbitrage strategy and, while sophisticated investors may find ways around the tax wedge, the processes are not simple and are likely to be subject to legislative prohibition once identified.

Perceptions of, and behavioural responses to, imputation and corporate tax

The perspectives and behaviour of market participants is another important consideration in determining the consequences of, and perceptions of the effects of imputation.

First, do company managers 'look through' corporate tax consequences to consider overall tax consequences for their shareholders in making decisions? The answer appears to be both yes and no. The available evidence suggests that some financial (dividend policy and capital structure) decisions and some operational decisions (offshore expansion) are influenced by imputation (see later and the Ainsworth et al. for more discussion on this). On the other hand, limited explicit attention paid to imputation in capital budgeting decisions and arguments about an excessively high corporate tax rate, and its consequences, suggest that this is not so.

In assessing the debate about the level and consequences of the Australian corporate tax rate, first, it is important to put it into the proper perspective by focusing on the overall taxation of corporate income – taking into account taxes paid directly at the corporate level and subsequently by shareholders. While some Asian jurisdictions have very low corporate tax rates (which draw attention), Australia's overall taxation of company income distributed as dividends is not that high by international standards – because of the effect of imputation. Figure 1 makes the relevant comparison of the overall tax rate on corporate income distributed as dividends, in which it should be noted that the investor level tax rate used is the highest marginal tax rate. If an 'average investor' tax rate were used, the important role in Australia of superannuation funds and charitable foundations (with 15 per cent and/or zero per cent tax rates) might be expected to improve the relative position on the international league table.

FIGURE 1: Overall dividend tax rate — 2015
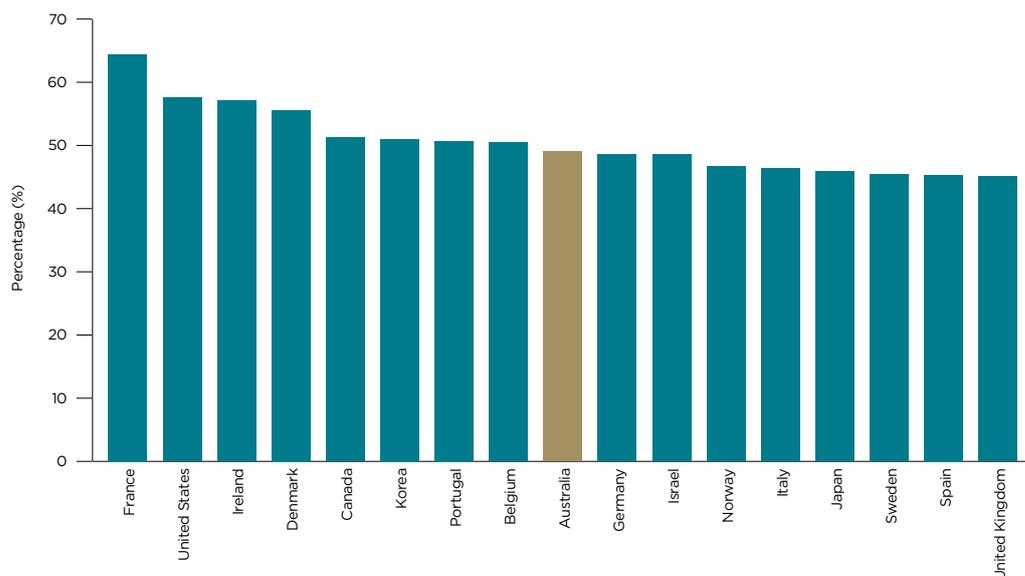
Source: OECD Dataset Tax Database: Table II.4. Overall statutory tax rates on dividend income.

Once recognition of the role of imputation credits is recognised, it becomes apparent that reducing the corporate tax rate under an imputation system is of little benefit to Australian investors if high dividend payout ratios prevail. Companies may be able to pay higher cash dividends, but these would be accompanied by a correspondingly lower level of franking credits. On the other hand, such a change would benefit foreign investors and foreign-owned companies operating in Australia (or managers of Australian companies who would prefer to retain earnings rather than face the discipline of the market in raising funds for expansion).

Also important, and reflecting the incomplete 'look through' in the discussion, is the issue of the relative taxation of different types of assets. It is often asserted that there is a tax bias against debt securities/bank deposits because interest payments are taxed at the investor's marginal tax rate whereas imputation credits on equities reduce tax payable by the investor. These arguments are sometimes misguided because they typically assume the same pre-tax rate of return (ignoring risk differences). But, more significantly, they ignore the effect of imputation on the relative pre-tax rates of return available to different types of securities.

The imputation system means that a given amount of corporate income generated is subject to the same overall amount of taxation regardless of whether it is distributed to Australian residents via interest on debt or dividends on equity. In the absence of imputation, the pre-tax rate of return on equity would be higher, although by how much depends on the position taken on the relative importance of international versus domestic factors in equity price determination. Under the extreme international integration view, Australian equity investors do get a 'free kick' from the tax concessions which means a higher after-tax rate of return than they require. Under the extreme domestic segmentation view, they are paying a higher share price for domestic equities which wipes out the benefit to them of the tax concessions (and transfers them to the company via a lower cost of capital).

One final aspect of imputation and perspectives lies in international comparisons of stock market performance. Much media focus is upon movements in the stock price index (such as the S&P/ASX 200) for the Australian market relative to similar indices overseas. When such comparisons are made over a short period (of days or weeks) there is little distortion introduced by focusing on price indices. But over longer periods of time, such as a year or more, relative market performance is distorted by ignoring the effect of substantially different dividend payout rates across countries. Dividend imputation, by encouraging high dividend payout, *ceteris paribus* depresses the price index relative to those of other countries with lower dividend payout rates. Appropriate comparison requires examination of accumulation indices which allow for such differences through an assumption of reinvestment of dividends. While institutional and sophisticated investors are well aware of this, the focus of media on price index comparisons does not help in the financial education of retail investors.

Imputation and capital gains tax interactions and consequences

If there is a tax bias affecting relative asset returns it is due to capital gains tax concessions which need to be considered jointly with imputation in assessing the consequences of imputation. This is important because companies can provide returns to investors via capital gains arising from retaining and reinvesting earnings rather than by paying dividends. This option has significant, differential effects depending on the company type. For listed Australian companies there is an incentive to pay dividends due to the prevalence of low-tax rate investors, such as Australian superannuation funds, in their shareholder base.

However, for private companies, with owners on marginal tax rates above the company tax rate, retention avoids current payment of some investor-level tax on franked dividends, and generates favourable (and deferred) taxation of realised capital gains. It is also relevant that the absence of double taxation of dividends (and tax deferment capital gains strategy possibilities) removes that tax bias against a business operating under a company structure rather than as an unincorporated enterprise. International data on comparisons of small business legal structures, while not conclusive, suggests that might be so.

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Imputation and other tax system features

The interaction of the imputation system with other aspects of the tax system is also important to consider, and not always well recognised. First, consider corporate tax concessions such as Research and Development allowances and accelerated depreciation. These are of limited benefit to Australian-owned companies. Less corporate tax may be paid directly, but more personal tax needs to be paid when dividends are paid. Higher cash dividends can be paid, but these are offset by lower franking credits being received. Again, capital gains tax interactions are relevant here since company managers have the option of retaining earnings whose investment hopefully generates capital gains tax concessions. Clearly, such tax concessions are of value to foreign-owned companies operating in Australia (and paying Australian company tax) for whom the reduction in franking credits payable is irrelevant.

Another potentially important interaction is with the taxation of superannuation. If a large/increasing percentage of Australian equities is held by super funds on a 15 per cent tax rate (in accumulation mode) or by super funds in retirement mode and charitable foundations both on a 0 per cent tax rate, then a large/increasing part of corporate profits escapes (or is subject to low) tax. With the continuing growth of superannuation and large investment in domestic equities, this is potentially a major problem for future government budgetary revenue.

Identifiable consequences of imputation

While there is ongoing debate about the overall effects of imputation, there are some relatively clear and discernible effects of imputation on financial and real sector decisions.

There is evidence that Australian listed companies generally have higher dividend payout ratios than comparable companies overseas. There have been a number of studies that demonstrate an increase in dividend payout ratios following the introduction of imputation such that Australian dividend payout ratios exceed those found overseas. Several other features of company financial behaviour follow from this, including: less use of on-market share repurchases; and greater use of dividend reinvestment schemes.

Australian listed companies also exhibit less leverage than found overseas, and leverage declined following the introduction of imputation. Evidence of this can be found both in aggregate data and in comparisons of listed companies.

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An important effect on operational decisions can also be identified in the data (and anecdotal evidence). Because income generated and taxed offshore does not generate franking credits, offshore expansion reduces the ability of a company to maintain the same franked dividend payout ratio. To the extent that shareholders value franking credits and this is reflected in the cost of equity capital, the higher cost of equity capital for offshore expansion provides a disincentive to such activities. At the same time, however, higher leverage (to take advantage of the interest tax shield) of foreign-domiciled subsidiaries involved in such activities may partly offset that effect.

Turning to investors, the imputation tax system appears to create a further 'home equity bias' among domestic investors. There is some support from international comparisons for the proposition that Australian superannuation funds are relatively more heavily invested in domestic equities than their offshore counterparts. But given different institutional features, the evidence is not conclusive and the effect appears to be more one of a tilt of portfolios than a dramatic shift.

Finally, imputation can be argued to have significant effect on financial structure and financing decisions. First, the use of preference share (rather than debt) structures for design of hybrid securities has been facilitated by the absence of a tax bias against such securities. Second, companies have endeavoured to find ways to 'stream' franking credits to domestic investors. This has been most apparent in two ways. One is the use of off-market share buyback structures to include a significant component of a franked dividend in the repurchase cost. Domestic investors, who value the attached franking credits have found participation attractive such that repurchase prices have been substantially below current market prices.

The second is the use of preference shares which specify a dividend with a gross amount explicitly incorporating franking credits such that foreign investors will not participate due to the correspondingly lower cash component. This is most apparent in the recently popular listed 'bail-in' hybrid securities issued by Australian banks as part of regulatory capital requirements. As a final example, Australia is the only country with significant use of stapled security structures by A-REITs and Infrastructure funds, with approximately 9 per cent of ASX market capitalisation taking this form. While there are a range of factors behind the use of such a structure, the consequent 'streaming' of much of the profits of operating activities through a trust structure rather than via the stapled company has less adverse consequences for government tax revenue under an imputation tax system than under a classical tax system. Consequently, unlike most overseas jurisdictions, such structures are permitted in Australia – even though there is some avoidance of tax when the withholding tax on trust distributions to foreign investors is less than the corporate tax rate.

Conclusion

The benefits of the imputation tax system are relatively clear. Corporate financial policies and the operation of the financial system are less distorted than under a classical tax system. Reduced (tax-induced) corporate leverage and higher dividend payout ratios are both advantageous for financial stability, market discipline and corporate governance.

There are some potential costs. The first of these is the consequence for government tax revenue. Removing imputation, without reducing the company tax rate would lead to a substantial increase in tax revenue. More realistically, estimates of a 'tax neutral' classical corporate tax rate tend to lie in the 15–20 per cent range such that government tax revenue could be increased by removing imputation and a smaller reduction in the company tax rate than that. A second possible 'distortion' lies in the effect of imputation on cross-border real and financial investment decisions both by Australian and foreign companies and investors.

But, in making such comparisons, the difficult problem is identifying the appropriate counterfactual or baseline scenario. Regardless of the alternative tax system considered, there will remain tax distortions induced by differences (and interactions) between the Australian system and the diverse variety of tax systems found globally. Whether these distortions would be of greater, or lesser, consequence than those that currently exist is difficult to ascertain.

Based on the available evidence, this author's admittedly subjective judgement is that the benefits of imputation outweigh its costs. Moreover, the disruption to financial markets caused by substantive change, such as abolishing imputation, (discussed in more detail in the larger paper, see endnote) would be substantial. Consequently the conclusion drawn is that the case for change is not proven.

The benefits of the imputation tax system are relatively clear. Corporate financial policies and the operation of the financial system are less distorted than under a classical tax system. Reduced (tax-induced) corporate leverage and higher dividend payout ratios are both advantageous for financial stability, market discipline and corporate governance.

Note

THE IMPACT OF DIVIDEND IMPUTATION *on share prices, the cost of capital and corporate behaviour*

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Debate continues about how dividend imputation affects equity markets. Central issues are whether franking credits are 'priced' by the market, and how imputation influences the behaviours of market participants. We argue that the presence of imputation affects investor and corporate behaviour, and that it would be dangerous to assume imputation has no effect on prices because they are entirely determined in global markets. Focusing on the impact on corporate behaviour, especially with regard to dividend payout and capital structure policies, we conclude that imputation matters and it has probably been beneficial.

Tax wedges, share prices and cost of capital

Let's start with the idea that the translation of company income through to the return ultimately received by an investor is subject to a 'tax wedge', comprising any corporate tax, plus taxes paid by the investor themselves. Assume that the investor requires a certain rate of after-tax return to invest in a company. It follows that a lower tax wedge means that the investor gets to access higher net income arising from the company's operations and, consequently would be willing to pay a higher price for the company, if all else remains unchanged. Further, the company needs to generate a lower income from its operations in order to generate the return that the investor requires – which effectively means the cost of capital is lower. Thus, reducing the tax wedge on corporate income can both raise share prices and lower the cost of capital. Now let's start complicating things.

Imputation allows the (domestic) corporate taxes paid to be distributed as a tax credit attached to dividends, which reduces the amount of income tax that a (domestic) investor is required to pay. As a result, it reduces the tax wedge relative to what would apply under a classical, 'double taxation' system. A problem with gauging the effects is that imputation affects shareholders differently. Some investors, like superannuation funds, benefit greatly, as imputation credits create a rebate stemming from the difference between the corporate tax rate (30 per cent on large companies) and the superannuation income tax rate (15 per cent). Others, like foreign investors, receive at best a modest or possibly no benefit: fully franked dividends are exempt from withholding tax although, in some instances, any withholding tax may be recouped in the home country. To further complicate things, imputation is just one component in a complex tax picture where different investors face a variety of tax rates and therefore different tax wedges. It is questionable, perhaps even dangerous, to focus on imputation in isolation (an issue directly raised by Lally and van Zijl (2003) with respect to capital gains tax, and also implicitly addressed by Dempsey and Partington (2008) in their valuation model for dividends).

Figure 1 provides a sense of the impact of differing tax wedges under some highly stylised assumptions. This chart plots the return that an Australian company is required to generate in order to deliver various investors a *6 per cent risk premium over the return on fixed interest (or 'risk-free' rate) after accounting for all taxes*. We call this the 'required return', as it equates to the return (i.e. capital gain plus dividends) that an investor needs from the shares before personal taxes are taken into account. However, it might also be thought of as the return that the company needs to generate from its operations after paying corporate taxes, and hence is equivalent to a cost of equity. The analysis assumes that the company pays a fully franked dividend yield of 5 per cent, no capital gains taxes are incurred, and the fixed interest return is 4 per cent. We first focus on the upper solid line, where the required return after personal taxes is 10 per cent for all investors. An overseas investor who pays no taxes and does not value imputation credits is satisfied with a 5 per cent capital gain plus a 5 per cent dividend. If this investor sets the cost of capital, the company would need to earn 14.3 per cent pre-tax (10 per cent scaled up for the 30 per cent corporate tax) on its investments to deliver this investor's required return. The possible cost of capital line varies above and below this zero personal tax baseline depending on the investor's tax status. For instance, a superannuation fund only needs the company to deliver an 8.9 per cent return before personal tax because the excess imputation credits top them up to 10 per cent after all taxes. The 47 per cent private investor requires a return of 11.2 per cent before personal tax to cover their higher personal tax liabilities, in order to achieve a net return of 10 per cent.

FIGURE 1: Required returns with investor income taxes
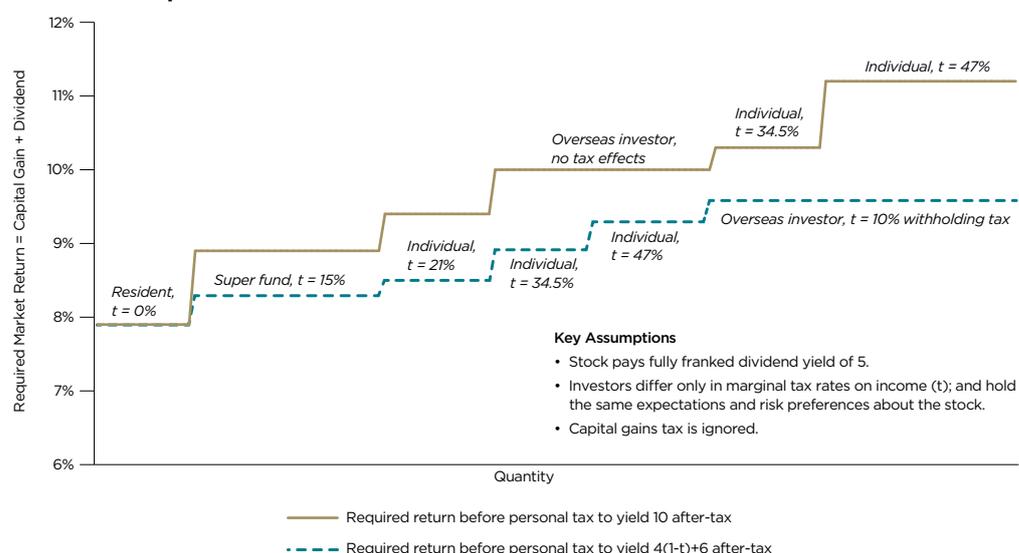
The lower dashed line in Figure 1 adds an additional complication. Here we assume that the 6 per cent required premium is in excess of the fixed interest return *after* personal tax. This assumption lowers the required return curve overall, with the magnitude of reduction varying across investors due to differing assumed tax rates on interest income. If we were to add in capital gains tax, the curve would shift yet again. The point we are trying to make is that how tax might affect company value and the cost of capital depends on *what* tax effects are taken into account.

What return might the 'market' require?

So how might imputation affect share prices and cost of capital when there are a variety of investors of differing tax status? In other words, how, and by whom, is market equilibrium determined? Unfortunately, there is no consensus among finance academics as to how differing investors' required returns before personal tax might translate into share prices. Figure 1 might be interpreted as presenting two different demand curves where income taxes and imputation credits are the only variables of interest. Two alternative approaches for translating investor demands into prices are: the aggregation approach and the marginal investor approach.

The *aggregation approach* simply involves estimating a weighted average of investor demands, often with reference to amounts invested and risk aversion (see Brennan 1970; Monkhouse 1993; Lally and van Zijl 2003). This approach implies that imputation *must* be partially priced. For instance, Black and Kirkwood (2010) estimate that approximately 60 per cent of Australian equities are held by domestic investors, while Handley (2014) reports on data indicating that domestic investors own 71 per cent of listed equities and 75 per cent to 81 per cent of total equity. Subject to the extent that domestic investors can fully utilise imputation credits and how investor demands are aggregated, this approach suggests that imputation credits might be priced in the order of 60 per cent to 80 per cent of face value.

The *marginal investor approach* is tantamount to drawing a supply curve on Figure 1, and working out where the demand and supply curves intersect. This approach accords with Miller (1977) among others, and is implicit in references to the 'marginal investor'. The Treasury's Tax Discussion Paper (TDP) and Gruen (2006) effectively adopt this stance, to the extent that they assume the marginal investor is an overseas investor who attaches no value to imputation credits. Under a strict interpretation of the marginal investor approach, imputation would make no difference only if the curves intersect at an investor that places no value on imputation credits, i.e. the zero tax-paying overseas investor in Figure 1. If intersection occurs elsewhere, then imputation will matter for share prices at the margin. Indeed, if a high tax-paying individual is the marginal investor, then imputation credits would be priced *and* the cost of capital could be higher than if shares were priced in global markets.

There are other potential complications under the marginal investor approach. The supply curve might not be fixed: a high cost of capital might lead companies to reduce investment and/or supply of equity, changing the point of intersection. The nature of investors operating in the market may change over time, such that imputation is priced in some situations and not in others. For example, imputation could influence pricing around dividend events, such as ex-dividend day drop-offs, because investors who benefit from imputation credits are active at the time. However, prices at other times may not be affected. Another possibility is that prices in different market segments might be set by different marginal investors with different valuations of imputation credits. For instance, imputation might be priced for domestic small-cap stocks but not large-caps held by international investors; or imputation might be priced for stocks that pay high fully franked dividends and so attract a clientele of investors who value imputation credits

Whether the marginal investor or aggregation approach best describes how imputation credits become priced in remains a point of debate. The marginal investor approach might be seen as more in keeping with the 'Economics 101' notions of price determination. By contrast, the aggregation approach assumes that investors have found their equilibrium position, given market prices. Another issue is that both approaches are often applied as if tax were the only determinant of differences in demand. In practice, an investor's demand may reflect a whole range of considerations, including their expectations, desire to diversify, liability hedging, portfolio constraints, other costs, and so on. This makes it particularly problematic to determine the value placed on imputation credits by observing investor behaviour, as it is entirely possible that a stock could be held for a raft of reasons other than imputation. Just because an investor receives imputation credits does not necessarily mean they have priced them.

The above discussion raises more issues than it resolves. But this is the key point. The manner in which imputation is priced by the market is quite unclear in theory. It is also going to be inherently difficult to estimate the value of imputation credits empirically, especially given that imputation is just one of many effects that determine share prices. The value attributed might also vary across stocks and through time, further compounding the problem of valuation. The most we can say is that the proposition that imputation is not priced is an extreme position along the spectrum of possibilities. Such a position can only be justified a priori by adopting the marginal investor approach, and presuming that the marginal investor is everywhere and always an overseas investor who places no value on imputation credits.

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The empirical evidence is inconclusive

The absence of clear theoretical guidance renders the pricing of imputation credits a largely empirical issue. Unfortunately, the empirical evidence is mixed. Again, no consensus emerges. The four methods commonly used to examine the pricing of imputation credits in the Australian equity market are:

1. *Dividend drop-off studies* — A sizeable number of studies observe the price change (drop-off) occurring when a stock goes ex-dividend. As the drop-off provides a measure of the combined market value of a 'package' of dividends and any attached imputation credits, the objective is to infer the value attributed to imputation credits by examining how they influence the relative magnitude of the drop-off.

2. *Comparative pricing studies* — Some studies attempt to infer the value of imputation credits by comparing differences in the pricing of securities that provide comparable stock exposure, yet differ in their entitlement to imputation credits. These include: certain derivatives versus the underlying stock; cum-dividend trades during ex-dividend periods; and new shares, such as bonus issues, which have differing claims to dividends relative to the old shares.

3. *Examination of returns* — Lajbcygier and Wheatley (2012) examine whether the presence of imputation credits is associated with lower realised returns under a range of asset pricing models. If imputation is priced, then stocks that pay imputation credits should generate lower market returns.

4. *Examination of price levels* — Saiu et al. (2015) consider whether imputation credits are associated with higher stock prices under various valuation models, a regression explaining forward earnings yields, and examining portfolios of stocks sorted by imputation credit yields.

A very mixed set of results emerges from this body of work. Figure 2 summarises the findings from the majority of dividend drop-off and comparative pricing studies. While a wide range of estimates emerges, on balance these studies indicate that imputation credits are partially priced. The data points in Figure 2 average 0.38, which would suggest that imputation credits are priced at about $0.38 in the dollar.

In contrast, examination of returns and price levels reveals little evidence that imputation credits are priced. Lajbcygier and Wheatley (2012) find that the presence of imputation credits is not associated with lower realised returns — if anything, they find a tendency towards the reverse. Saiu et al. (2015) generate a mixed set of results, but overall emerge with no clear evidence that stocks paying franked dividends are priced more highly.

FIGURE 2: Empirical estimates of value of imputation credits attached to dividends

Dotted or dashed lines: Drop-off studies
Solid lines: Comparative pricing studies

Thus, empirical research suggests that imputation credits may be partially priced based on examination of dividend events, while any footprints from imputation are hard to detect in either returns or price levels. One possible way to reconcile these conflicting findings is to draw on the earlier point that the identity of the marginal investor around dividend events may differ from that determining price levels and longer-term expected returns. Figure 3 illustrates how this might play out. The upper dashed line represents a notional price path where 50 per cent of the value of imputation credits is capitalised into the price level, while the lower bold line aligns with no value for imputation credits being incorporated into prices. Annual market returns are 1 per cent lower where imputation credits are partially priced, relative to where they not priced. This 1 per cent annual return difference is attributable to differences in *dividend yield*, reflecting different share price levels. Nevertheless, both price paths are drawn such that the dividend drop-off ratio is (nearly) the same under both scenarios, reflecting the dividend plus 50 per cent of the imputation credit. Thus the lower bold line reflects a scenario whereby imputation affects neither the price level nor long-run returns, but yet is still reflected in drop-off rates. However, this is just one interpretation of what might be occurring.

FIGURE 3: Dividend drop-off and price level
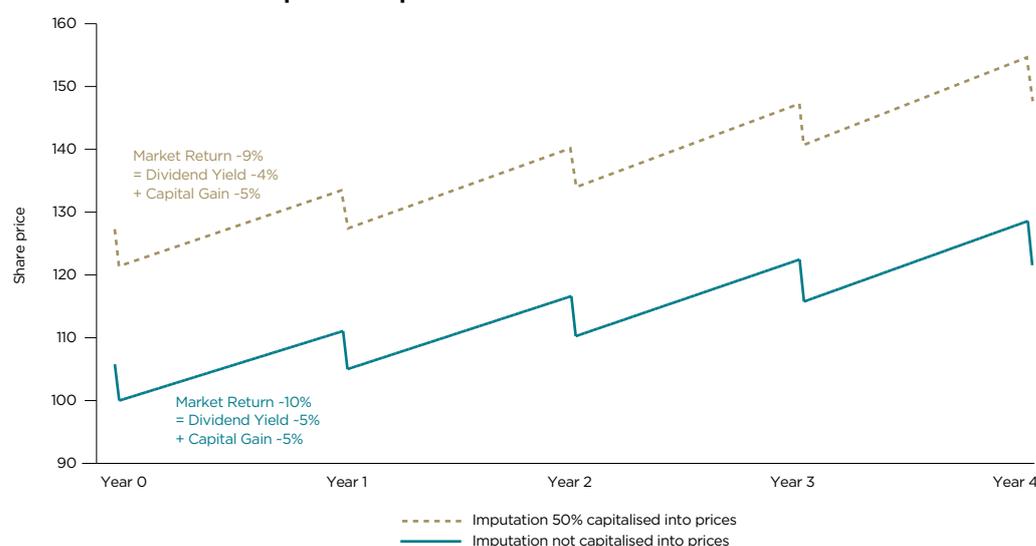
Notes:
Same dividend and imputation credit
Similar drop-off = dividend + 50% imputation credit, but ...
Different price level, valuation measures and returns

Another issue is that there are substantial methodological problems in identifying the value attributed to imputation credits in the market. Indeed, all the empirical findings discussed above should be viewed with caution. The most substantive problem relates to the fact that dividends and imputation credits arrive together as a package. This greatly hampers the ability of researchers to confidently tease out how imputation impacts prices relative to other influences. It is known as the 'allocation problem', and refers to the identification issues that arise from the need to disentangle two components that are highly correlated with a problematic distribution (most dividends are either fully franked or unfranked). Other empirical problems relate to: the possible existence of confounding influences around dividend events (e.g. capital gains tax effects, costs and risks associated with arbitrage); the sensitivity of results to method and sample; and the possibility that dividends or imputation credits may be acting as proxies for unobserved variables.

In summary, between the mixed results and methodological problems, it is impossible to trace a clear empirical link from imputation to the cost of capital. On balance, imputation appears to affect share price patterns around dividend events, and hence plays some role in determining prices. However, there is no clear evidence linking imputation through to higher share prices, lower returns and thereby also a lower cost of capital.

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Imputation *does* appear to influence behaviours

Notwithstanding the ambiguous theory and empirical findings, there are strong signs that imputation has influenced the behaviours of companies and investors. Further, some of these behaviours are sufficiently constructive to support a case that the imputation system has yielded benefits, regardless of any cost of capital impacts.

The clearest effect is that the imputation system has encouraged ***higher dividend payouts***. Figure 4 reveals a stark divergence in the dividend payout ratios for the Australian and world equity markets after imputation was introduced. A number of researchers have conducted analysis that confirms the link between imputation and higher payouts, e.g. Callen et al. (1992), Pattenden and Twite (2008), and Brown et al. (2015). In contrast, a survey by Partington (1989) found that tax was ranked as the least important consideration in payout policy prior to the introduction of imputation.

FIGURE 4: Dividend payout ratio
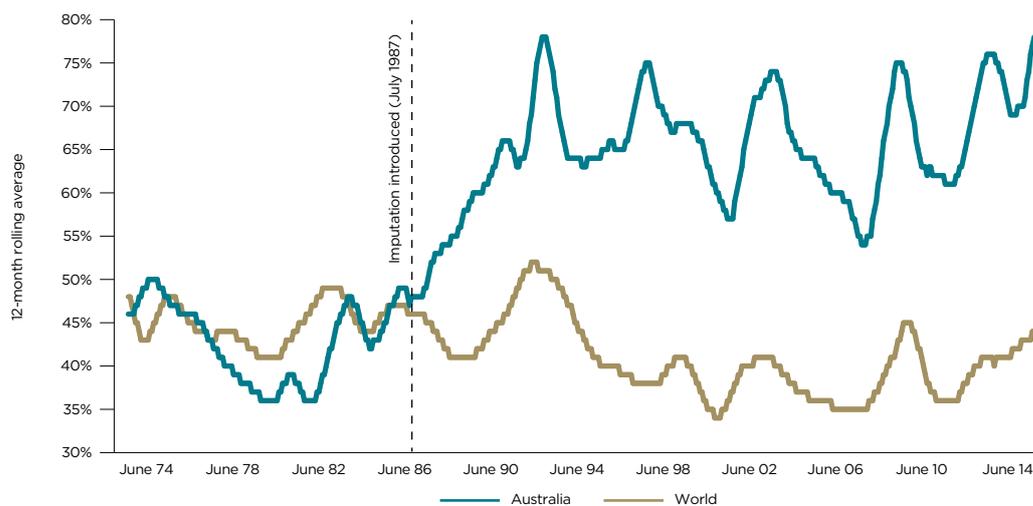
Source: Datastream.

We surmise that imputation induces higher payouts because companies recognise that imputation credits are beneficial to some shareholders, and try to distribute them accordingly. Doing so allows them to demonstrate that they have shareholders' interests at heart. In addition, the costs of distributing imputation credits are often relatively minor. The desire to distribute imputation credits is also revealed in the use of dividend streaming in the early years of imputation, the use of structured off-market buybacks, and the use of dividend reinvestment plans to facilitate the distribution of higher dividends.

We contend that the main benefit of higher payouts is that they *create capital* discipline, which is good for both shareholders and the economy at large. Higher payouts erode the 'money burning a hole in our pockets' syndrome, whereby companies may feel they need to do something with any spare cash. It increases the likelihood that companies will have to seek external funding for investments, which requires them to justify their plans in the process. Further, investors are given the opportunity to 'recycle' the funds back towards the most worthy investments. Thus, higher payouts make it more likely that good investments are pursued.

It has been argued that the imputation system has contributed to lower *corporate* leverage by reducing the tax bias in favour of debt over equity that arises under a classical system. Here the evidence is less clear. Figure 5 reveals that Australian corporate leverage declined markedly in the early-mid 1990s, settling at much lower levels than observed prior to the introduction of imputation.

FIGURE 5: Net debt/equity for Australian non-financial corporations

Source: Australian Bureau of Statistics, Cat. No. 5232.0.

The extent to which imputation was a key driver of the shift in leverage is an open issue. First, the theory of how tax impacts on capital structure remains unresolved. Myers (2001) notes three theories of the capital structure (trade-off theory; pecking order theory; free cash flow theory) plus the alternative that capital structure doesn't matter. Only the first theory suggests that tax matters, and Miller (1977) disputes this, arguing that tax benefits are neutralised in equilibrium. Some researchers have tied the introduction of imputation to changing capital structures in the 1990s (Twite 2001; Pattenden 2006). However, many other influences can be identified at the time. Mills et al. (1993) point to: an upwards shift in real borrowing costs; a potential decline in the cost of equity; changing attitudes towards gearing; forced restructurings for some firms; and the growing availability of hybrid instruments. Also, the fact that excessive debt played a key role in propagating the 1990s recession probably compounded the aversion to gearing, while inflation fell markedly in Australia following the 1990s recession, as did the corporate tax rate after 1987–88. Basically, there was too much going on to be confident that imputation was a prime cause of reduced corporate leverage. Nevertheless, it is entirely possible that it was a contributing factor.

Imputation could potentially impact on other behaviours, which we mention here without exploring them in any depth. It encourages Australian companies to invest in the Australian economy, in preference to overseas. This is not necessarily a bad thing, given some of the failed overseas ventures by Australian companies, and the fact that investors can always gain exposure to overseas companies on their own account, rather than needing companies to do it on their behalf. Imputation may also encourage companies to pay their Australian corporate tax at the margin, with potential benefits for the integrity of the tax base. It is worth noting that imputation probably matters more for small, domestic companies (at least those profitable enough to pay corporate tax). It is in this segment that local investors who value imputation credits are more likely to determine share prices, and be chiefly responsible for providing funding.

Concluding remarks

The value of the imputation system has been under scrutiny over recent years, which might be traced back to Gruen (2006), and was taken up by the 2015 Tax Discussion Paper. The premise is that imputation is of limited benefit as the cost of capital is assumed to be determined by international investors who do not value imputation credits. As such, imputation rewards domestic investors with a tax cut without lowering the cost of capital.

It has been suggested that Australia would be better off removing or restricting imputation as a trade-off for a lower corporate tax rate. In evaluating this case, it is important to fully consider the effects that imputation might be having.

While the theory and evidence may be unclear, the notion that imputation has no impact on share prices and the cost of capital sits at the extreme of the spectrum of possibilities. It is more likely that imputation has had some effect on share prices, even if just in certain situations such as for smaller, domestic companies. Further, imputation appears to have influenced behaviours, some of which have been beneficial. It has encouraged higher dividend payouts, and possibly lower corporate leverage and a propensity for Australian companies to invest domestically at the margin. On balance, we believe that the imputation system has made a positive contribution to the Australian economy.

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Further detail is provided in our 2015 CIFR Working Paper, '[Do franking credits matter? Exploring the financial implications of dividend imputation](#)'.

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DIVIDEND IMPUTATION
and the corporate cost of capital

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The contentious debate about how to best estimate the value of imputation credits has been heightened in the regulatory setting. While an accurate estimate of the cost of capital is important for every firm, it is particularly important for regulated infrastructure firms where a regulator sets the allowed revenue each year in accordance with its estimate of the cost of capital. This paper explains how the regulatory allowance depends on the estimated value of imputation credits and summarises the debate that has occurred, over many years, in this setting.

The valuation of dividend imputation tax credits has been a contentious issue in Australia ever since the imputation tax system was introduced in 1987. A range of theoretical and conceptual frameworks have been proposed and a range of empirical estimation methods have been used. Some of the divergence of views has been summarised by Ainsworth et al. (2016) in this issue.

One of the reasons that so much attention has been focused on this issue is that the value of imputation credits has a potential impact on a firm's cost of capital — if imputation credits are valuable to investors in aggregate, the firm's cost of equity capital will be reduced as shareholders receive part of their required return from the government via imputation tax credits.[1]

Whereas an accurate estimate of the cost of capital is important for every firm, it is particularly important for regulated infrastructure firms such as gas and electricity networks and some rail, port, telecommunications and water assets. In those cases, a regulator sets the allowed revenue each year in accordance with its estimate of the cost of capital. Thus, the firm's bottom line varies depending on the regulator's estimate of the cost of capital, which in turn depends on the estimate of the value of imputation credits.

One of the reasons that so much attention has been focused on this issue is that the value of imputation credits has a potential impact on a firm's cost of capital — if imputation credits are valuable to investors in aggregate, the firm's cost of equity capital will be reduced as shareholders receive part of their required return from the government via imputation tax credits.

Dividend imputation tax credits represent a portion of the return to equity

There are two (equivalent) ways to see how dividend imputation might affect the corporate cost of capital:

> It will cost the firm less to provide equity investors with the return that they require. That is, for a given total required return on equity (set in global capital markets), the cost to the firm will be reduced by the extent to which investors value imputation credits. Suppose, for example, that investors have a 10 per cent required return on equity for a particular firm. In a classical tax system, the firm would be solely responsible for generating that return for shareholders. In an imputation system, however, the government provides equity holders with potentially valuable imputation credits. If investors (in aggregate) receive a yield of say 1 per cent from those credits, the firm will need to pay only 9 per cent to its shareholders.

> To the extent that equity investors (in aggregate) value imputation credits, they will bid up the stock price to reflect the present value of those credits. Consequently, a firm will be able to raise more equity from a given stream of dividends.

That is, the imputation system provides a type of subsidy for the firm's payment of returns to equity holders in much the same way as the firm receives a tax subsidy for the interest payments that it makes to its debt holders. In the case of equity, the subsidy comes via the distribution of imputation credits and, in the case of debt, the subsidy arises from the deductibility of interest payments. In both cases, the firm's *after-tax* cost is the total return that investors require, less the value of the tax subsidy from government. Other things being equal, a higher or more valuable tax subsidy will mean a lower cost of capital for the firm.

In his seminal paper on this topic, Officer (1994)[2] shows that the firm's weighted-average cost of capital (WACC) in a dividend imputation tax system can be written as:

$$WACC = \frac{E}{V} r_e \left[\frac{1-T}{1-T(1-\gamma)} \right] + \frac{D}{V} r_d \left[1-T \right]$$

where

$\frac{E}{V}$ and $\frac{D}{V}$ represent the relative proportions of equity and debt finance, respectively

r_e and r_d represent the total required return on equity and debt, respectively

T is the relevant corporate tax rate, and

γ or "gamma" represents the value of imputation tax credits.

In this equation, r_d represents the total return that debt holders require from their investment in the firm and $\left[1-T \right]$ represents the proportion of that return that must be provided by the firm — the balance being provided via a government tax subsidy. To see this, consider a firm that borrows $100 at 7 per cent. At the end of the year, the firm makes an interest payment of $7.00, but then gets $2.10[3] of this back from the government — because interest is tax deductible. Thus, the *net* cost to the firm, or the *after-tax* cost is $4.90.[4] In algebraic terms, the cost to the firm of paying the required return to the debt holders is $r_d \left[1-T \right]$.

The same applies to the cost of equity. In the Officer equation, r_e represents the total return that equity holders require from their investment in the firm and $\left[\frac{1-T}{1-T(1-\gamma)} \right]$ represents the proportion of that return that must be provided by the firm. In the case of equity, the firm is responsible for paying dividends and generating capital gains, and the government contributes imputation credits via the tax system. The WACC formula reflects the cost to the firm of paying the required return to the equity holders. For example, if the corporate tax rate is 30 per cent and the value of imputation tax credits is 25 per cent of the face amount of credits that are generated by the payment of corporate tax, the Officer formula suggests that the firm must contribute $\left[\frac{1-0.3}{1-0.3(1-0.25)} \right] = 90.32\%$ of the equity holders' required return on equity via dividends and capital gains, with the other 9.68 per cent being provided by government as imputation credits.[5]

Application to infrastructure regulation

The idea that equity holders receive a portion of their required return on equity is particularly important in the context of infrastructure regulation. Infrastructure assets such as electricity and gas distribution and transmission networks, water businesses and some telecommunications, rail and port assets are natural monopolies. For example, there will only be a single electricity distribution network in any city. To ensure that prices do not reflect monopoly rents and that the efficient amount of investment occurs, an economic regulator will determine the maximum allowed revenue each year for the regulated business. For example, the Australian Energy Regulator (AER) is responsible for regulating gas and electricity transmission and distribution businesses in all states other than Western Australia. The total value of the assets of these companies is in the hundreds of billions.

The way the AER goes about setting the maximum allowed revenue for each business is to use what is known as a 'building block' approach. This involves setting the allowed revenue such that the regulated firm is able to cover efficient operating costs, corporate taxes and regulatory depreciation,[6] and generate sufficient profits to provide a fair return on capital. The return on capital is the product of what the regulator considers to be a fair return for investors (or WACC) and the value of the assets that are being regulated (known as the regulated asset base, or RAB). For example, if a firm has assets with a value (RAB) of $7 billion and the regulator has determined that a fair return (WACC) is 10 per cent, the firm would be allowed to charge prices so that its profit (after covering efficient operating costs etc.) was $700 million. This profit would then be paid to investors as a return on the capital that they have provided to the firm. The regulator will separately determine what it considers to be a fair return on debt and equity capital (in light of the different nature and risk of those two forms of investment) and combine them by taking a weighted-average to form an estimate of the WACC.

It is the return on equity capital that is relevant to the discussion about the benefits of the dividend imputation tax system. As previously indicated, dividend imputation tax credits form a part of the return that equity holders receive, and that component of the return is paid by government via the tax system. So if, as in the simple example provided, equity holders require a total return of 10 per cent and imputation credits provide a yield of 1 per cent, the regulated firm will be allowed to generate a profit that allows it pay a 9 per cent return to its equity holders. Thus, for regulated infrastructure firms a higher regulatory valuation of imputation credits means commensurately lower allowed revenues.

This means that it is very important for the regulator to accurately estimate the extent to which the market values imputation credits — if the regulator overestimates the value of imputation credits investors in the firm will be undercompensated, and vice versa.

The appropriate estimate of gamma has long been a point of contention in the regulatory setting. Prior to 2009, the Australian regulatory approach had always been to set gamma at 0.5. In its 2009 WACC Review, the AER proposed to change its estimate of gamma to 0.65.[7] This decision was appealed by the first set of regulated network businesses to have that estimate applied to them. The Australian Competition Tribunal ruled that the AER had erred in deriving its new estimate and substituted a new estimate of 0.25.[8] That estimate remained in force until the AER released its 2013 Rate of Return Guideline, which proposed that the estimate of gamma should be restored to 0.5. Shortly afterwards, the AER reduced its proposed estimate to 0.4 and the AER applied that estimate in a number of decisions in 2015. Those decisions were also appealed to the Tribunal, which in February 2016 again ruled that gamma should be set at 0.25. That is, the estimation of the value of imputation credits has been a topic of considerable debate in the Australian regulatory setting over many years. The main issues in this debate are considered below.

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Firms outside the regulated infrastructure sector also have to address the issue of estimating gamma as that affects their own calculations of their cost of capital, which is used for the purposes of evaluating proposed new projects and setting hurdle rates.

The regulatory approach for incorporating the value of imputation credits

Officer (1994) goes on to show that the value of imputation credits can be incorporated in valuation exercises by making an adjustment to the discount rate (as above) or to the cash flows that are analysed, and that both approaches produce identical results. That is, it is equivalent to considering the government 'subsidy' as providing either part of the return that shareholders require or part of the cash flows that shareholders receive.

In this regard, the regulatory rules implement Officer's imputation credit adjustment to the return on equity via the allowance for the corporate tax cash flow rather than via the (equivalent) adjustment to the discount rate. Where the value of imputation credits is incorporated via the cash flows, a simple 'vanilla' version of the WACC is used:

$$WACC = \frac{E}{V} r_e + \frac{D}{V} r_d.$$

To see that the two approaches are equivalent, consider an example consistent with the one above, where equity holders require a return of 10 per cent and (because gamma is estimated to be 0.25) 0.968 per cent of this is deemed to come in the form of imputation credits.[9] If the equity holders have invested $1,000 of equity capital in the firm they will require a total return of $100. In the absence of imputation, the firm would have to be allowed to earn a pre-tax profit of $143. The firm would then pay $43[10] of corporate tax, leaving the required $100 to return to equity holders.

However, with imputation, the pre-tax profit would only have to be $129. The firm would then pay $38.71[11] of corporate tax, creating the same amount of imputation credits.[12] This leaves $90.32 to be returned to equity holders. The equity holders also receive some value in the form of imputation credits — $38.71 of credits are created and each is estimated to have a value of 0.25, giving a total value of $9.68. Thus, the equity holders receive a return from the firm of $90.32 and credits valued at $9.68, giving them the total $100 return that they require.[13]

Note that the Officer formula above implies that the corporate tax amount of $38.71 can be calculated directly as:

$$\begin{matrix} Corporate \\ tax \end{matrix} = \begin{bmatrix} Total\ required \\ return\ to\ equity \end{bmatrix} \times \frac{T}{1 - T(1 - \gamma)} = 100 \times \frac{0.3}{1 - 0.3(1 - 0.25)} = 38.71.$$

This calculation is embedded into the regulatory assessment of allowed revenues.[14]

Estimating the value of imputation tax credits

The standard approach for estimating the value of imputation tax credits is as the product of two sub-parameters:

$$\gamma = F \times \theta$$

where F is the proportion of created credits that are attached to dividends and distributed to investors, and θ, or 'theta' is the market value of a distributed credit.

For example, if 70 per cent of credits are distributed and each of those is valued by the market at 35 per cent of the face amount, $\gamma = 0.7 \times 0.35 = 0.25$. Thus, we need estimates of the distribution rate and theta.

The distribution rate

The distribution rate is the ratio of credits distributed to credits created. Credits are created whenever a company pays corporate tax to the Australian Tax Office (ATO) and credits are distributed when attached to dividends. For every dollar of dividends paid, the firm can attach $\frac{T}{1-T}$ dollars of imputation credits. The only way a firm can distribute all of the credits that it creates in a year is to distribute 100 per cent of its Australian profits as dividends. But firms generally do not do this, preferring to reinvest some portion of profits back into the firm to finance future growth. Consequently, some credits are not distributed. In fact, as at the end of the 2013 financial year (the last year for which data is available) there were more than $270 billion of credits that have been created by firms but not distributed.[15]

The cumulative imputation credit distribution ratio has been very stable for many years at around 70 per cent, as shown in Figure 1 below.

FIGURE 1: Cumulative imputation credit distribution rate
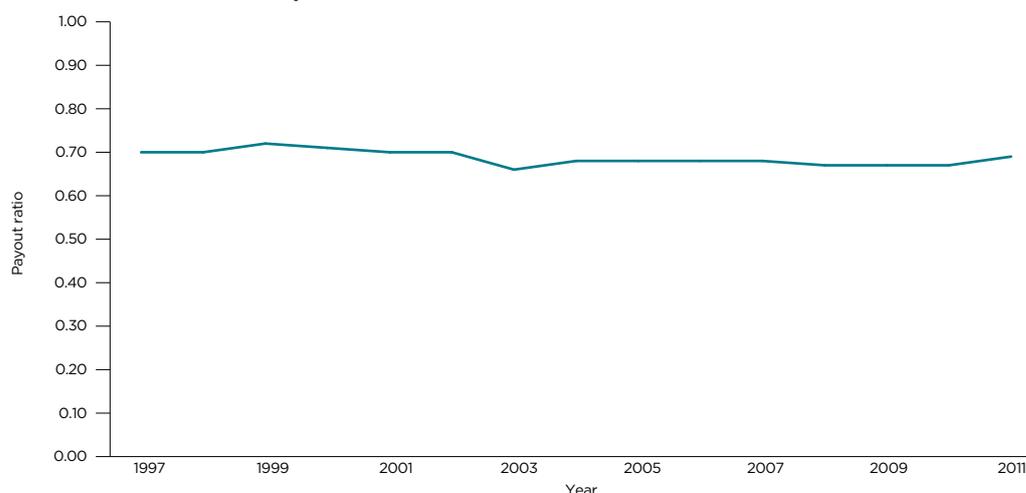
Source: Australian Taxation Office.

In the regulatory setting, the Australian Competition Tribunal has been called upon twice in recent years to adjudicate upon the estimation of gamma — in the 2011 Gamma case led by ETSA Utilities[16] and in the recent Networks NSW case. In both cases, the Tribunal adopted a distribution rate of 70 per cent, consistent with the evidence set out in Figure 2.[17]

The value of distributed credits, theta

The other component of gamma is the value of distributed credits in the hands of investors. There are a number of reasons why distributed credits would be valued, in aggregate across the market, at less than the face amount. These include:

> Credits that are distributed to non-resident investors have no value as they cannot be redeemed.[18]

> Some credits that are distributed to resident investors cannot be redeemed due to the 45-day rule.[19]

> There is an administrative/accounting cost as credits have to be recorded and claimed.

> There is a time value loss as distributed credits cannot be immediately converted into cash — they are recorded in the investor's tax return when it is lodged after the end of the financial year.

> In the absence of dividend imputation, investors will select a portfolio of investments that is optimal for them. Imputation is likely to lead resident investors to tilt their portfolio more towards stocks that distribute imputation credits. They will do this to the extent that the value of these credits (to them) exceeds the costs of moving the portfolio away from what would otherwise be optimal. It is the net value that is relevant — the total value of the credits net of the cost of moving away from the optimal portfolio.

Thus, we require an estimate of the extent to which the aggregate value (to investors) of distributed credits is less than the face amount of those distributed credits. The majority of the recent work on this question has been performed in the regulatory setting where the regulator's estimate of the value of imputation credits directly affects the allowed revenue. In recent years, the AER has used two approaches — redemption rates and dividend drop-off analysis.

The redemption rate is an estimate of the ratio of credits redeemed to credits distributed, and the AER has used two approaches to estimate this ratio. The first is a direct estimate from ATO tax statistics of total credits redeemed and total credits distributed across the whole economy each year. The most recent estimate from this approach is 45 per cent.[20]

The AER has also estimated the redemption rate by using an 'equity ownership' approach based on Australian Bureau of Statistics data on the proportion of Australian shares owned by resident investors. This approach is based on a number of assumptions including:

> All credits distributed to resident investors will be redeemed.

**>** All credits redeemed are valued at the full face amount.

The AER's most recent estimate from this approach is a range from 38 per cent to 68 per cent.[21]

Regulated businesses have twice challenged the AER's use of redemption rates in appeals to the Australian Competition Tribunal. In both the 2011 Gamma case and in its 2016 judgment in the Networks NSW case the Tribunal held that the redemption rate cannot be used as an estimate of the value of distributed credits, but can only be used as an upper bound against which any point estimate can be tested.[22]

This leaves the second approach that the AER has used for estimating the value of distributed credits — dividend drop-off analysis. This approach involves some form of regression of the dividend drop-off (the change in the stock price over the ex-dividend day, when the dividend and credit separate from the share) on the amount of the dividend and the amount of the attached credit. A number of different econometric specifications are usually used to control for variation in stock prices and stock return volatility across the sample and to ensure that the results are as robust as possible.

Dividend drop-off analyses were also considered by the Tribunal in the 2011 Gamma case and the recent Networks NSW case. In the 2011 case, the Tribunal directed that a new drop-off analysis should be conducted by SFG Consulting.[23] This study used a range of econometric approaches set out in Terms of Reference that were approved by the Tribunal. The primary estimates from that study, updated to the end of 2012, are summarised in Figure 2. The conclusion from this study is that the value of distributed credits (theta) should be set at 0.35 and the Tribunal has adopted that estimate.[24]

FIGURE 2: Estimates of the value of distributed credits (theta) from the SFG Consulting drop-off study
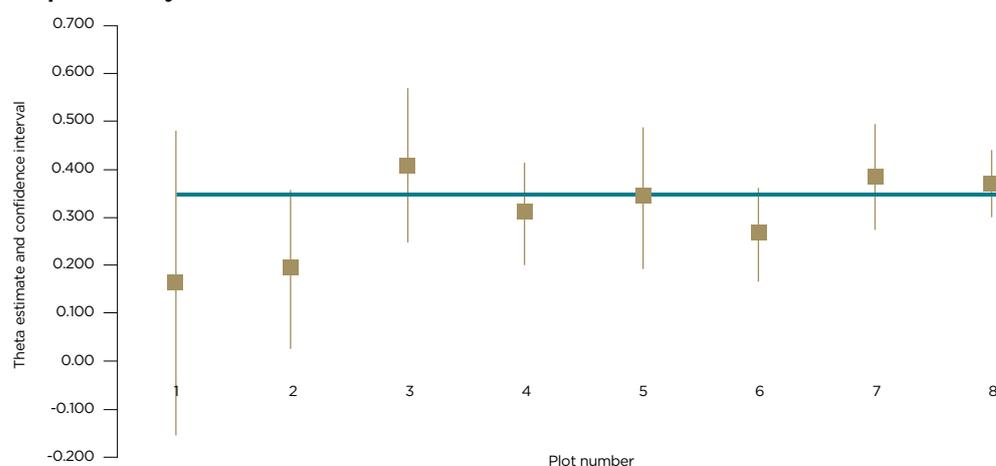
Source: SFG Consulting 2013, Figure 5, p. 24. Each plot number is for a different econometric specification.

In its recent Networks NSW decision, the Tribunal again adopted a theta of 0.35[25] based on the updated estimate from SFG Consulting.[26] The Tribunal also noted that this estimate was somewhat lower than all of the upper bound redemption rate estimates, therefore passing that cross-check.[27]

The current regulatory estimate of gamma

In both of the cases where it has considered the value of imputation credits, the Tribunal combined a 70 per cent distribution rate with a theta of 0.35 to produce an estimate of gamma of 0.25 (= 0.7 × 0.35).[28]

A gamma of 0.25 implies that imputation credits provide approximately 10 per cent of the required return on equity.[29] Consequently, allowed revenues will be set such that the firm is able to provide 90 per cent of the return on equity to equity holders, who are assumed to recover the other 10 per cent from imputation credits.

The Tribunal has now twice ruled that:

> Gamma should be interpreted as the market value of imputation credits and must be estimated on that basis.

> Estimates of the redemption rate can only be used to set an upper bound and cannot be used as a point estimate.

> The best available estimate of gamma is 0.25.

However, within regulatory circles, there remains a range of views about how gamma should be interpreted and estimated. It is only the optimists who would think that this issue has been settled in the Australian regulatory setting.

Notes

1. The precise mechanics of how imputation affects the corporate cost of capital is addressed in the following subsection.

2. Officer, R, 1994, 'The cost of capital of a company under an imputation tax system,' *Accounting and Finance*, vol. 34, pp. 1–17.

3. $7.00 × 30%, the corporate tax rate.

4. $7.00 − $4.90.

5. The derivation of the Officer formula is explained via a simple numerical example in an appendix.

6. Australia operates an 'incentive based' regulatory framework whereby the regulator makes an assessment of the operating costs, corporate taxes, and depreciation that would be incurred by an efficient business, rather than allowing the business to recover whatever its actual costs might have been. If the business is able to beat the efficient benchmark, it keeps some of the efficiency gains. If businesses consistently beat the regulatory allowance, the regulator will redefine what it considers to be efficient and the process begins again.

7. For reasons that are set out in more detail below.

8. For reasons that are set out in more detail below.

9. The officer formula shows that when gamma is set to 0.25, 9.68% of the total required return on equity comes in the form of imputation credits.

10. 30% of $143.

11. 30% of $129.

12. Every dollar of corporate tax paid in Australia creates a dollar of credits.

13. A more detailed explanation of the equivalence of the two approaches for reflecting the estimated value of imputation credits is set out in an appendix.

14. For example, it appears at Row 59 of the Analysis tab in the AER's Post-Tax Revenue Model (PTRM).

15. ATO tax statistics, 2012–13.

16. Now SA Power Networks.

17. The judgment in the 2011 Gamma case is available as *Application by Energex Limited (Gamma) (No 5)* [2011] ACompT 9 (12 May 2011), see para. 42. The judgment in the Networks NSW case is available as *Applications by Public Interest Advocacy Centre Ltd and Ausgrid* [2016] ACompT 1 (26 February 2016), see para. 1106.

18. Technically, non-resident investors can use imputation credits to eliminate withholding tax, but this is of no net benefit as investors generally receive a credit in their home jurisdiction for any withholding tax paid in Australia.

19. Any investor who buys and sells shares within a 45-day period is unable to redeem credits attached to dividends attached to those shares.

20. AER Jemena Electricity Networks Preliminary Decision, October 2015, Appendix 4, p. 18.

21. AER Jemena Electricity Networks Preliminary Decision, October 2015, Appendix 4, pp. 18–19. The AER adopts a range of 56–68% for all equity and 38–55% for listed equity.

22. See *Application by Energex Limited (Gamma) (No 2)* [2010] ACompT 7 (13 October 2010) para. 91 and *Applications by Public Interest Advocacy Centre Ltd and Ausgrid* [2016] ACompT 1 (26 February 2016), paras 1095–96.

23. SFG Consulting, 2011, 'Dividend drop-off estimate of theta', Report for the Australian Competition Tribunal, 21 March. This study was authored by Prof Stephen Gray (the author of the current paper) and Dr Jason Hall, who have prepared a number of reports on the estimation of gamma for regulated entities. This study has been updated to the end of 2012 in SFG Consulting 2013, 'Updated dividend drop-off estimate of theta', 7 June.

24. *Application by Energex Limited (Gamma) (No 5)* [2011] ACompT 9 (12 May 2011), see para. 38.

25. *Applications by Public Interest Advocacy Centre Ltd and Ausgrid* [2016] ACompT 1 (26 February 2016), para. 1103.

26. SFG Consulting, 2013, 'Updated dividend drop-off estimate of theta', report for the Energy Networks Association, 7 June.

27. *Energex Limited (Gamma) (No 5)* [2011] ACompT 9 (12 May 2011), paras 33–34 and *Applications by Public Interest Advocacy Centre Ltd and Ausgrid* [2016] ACompT 1 (26 February 2016), para. 1111.

28. *Energex Limited (Gamma) (No 5)* [2011] ACompT 9 (12 May 2011), para. 42 and *Applications by Public Interest Advocacy Centre Ltd and Ausgrid* [2016] ACompT 1 (26 February 2016), para. 1171.

29. From the Officer (1994) formula, $\left[\dfrac{1-0.3}{1-0.3\,(1-0.25)}\right] = 90\%$.

DIVIDEND IMPUTATION:

The international experience

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An overlooked aspect of the debate surrounding Australia's dividend imputation system is the international experience with dividend imputation. Between 1999 and 2008, nine countries removed their dividend imputation systems. This raises a number of questions. What was the motivation for removing imputation? How were dividends taxed after imputation was removed? What happened to corporate tax rates? What are the lessons for Australia? This paper seeks to provide answers to these questions.[1]

Along with Canada, Chile, Mexico and New Zealand, Australia is one of only five countries in the Organisation for Economic Co-operation and Development (OECD) that continues to operate a full imputation tax system where all corporate tax is credited to domestic shareholders. Malta, a non-OECD country, also has a full imputation system. The OECD lists Korea and the United Kingdom as operating partial imputation systems. However, as the tax credits provided in these countries are not linked to the amount of corporate tax paid, these are not true imputation tax systems. Many countries have shifted away from imputation systems, including the United Kingdom (1999), Ireland (1999), Germany (2001), Singapore (2003), Italy (2004), Finland (2005), France (2005), Norway (2006) and Malaysia (2008). Table 1 provides an overview of the changes.

TABLE 1: Overview of country-specific changes away from dividend imputation

Country	Date Removed	Before	After
United Kingdom	July 1997	Partial imputation. Tax credit of 25 cents per $1	No refunds of credits to tax-exempt institutions (e.g. pension funds)
United Kingdom	April 1999	See above	Imputation rate cut from 20% to 10% and no refunding of unutilised credits
Ireland	April 1999	Partial imputation. Tax credit of 12.4 cents per $1	Dividends double taxed and corporate tax rate reduced
Germany	January 2001	Full imputation. Tax credit of 43 cents per $1	50% of dividend taxed
Singapore	January 2003	Full imputation. Tax credit of 32 cents per $1	Dividends tax-exempt for shareholders
Italy	December 2004	Full imputation. Tax credit of 52 cents per $1	Withholding tax of 12.5% for individuals
Finland	January 2005	Full imputation. Tax credit of 40.8 cents per $1	57% of dividend taxed
France	January 2005	Full imputation. Tax credit of 50 cents per $1	50% of dividend taxed
Norway	January 2006	Full imputation. Tax credit of 38.9 cents per $1	28% tax rate on dividends if within rate of return allowance
Malaysia	January 2008	Full imputation. Tax credit of 37 cents per $1	Dividends not taxed

United Kingdom and Ireland

The United Kingdom (UK) and Ireland both operated imputation systems with Advance Corporation Tax (ACT). ACT was essentially the prepayment of corporate tax on distributed profits. The UK government refunded 20 per cent out of the 33 per cent corporate tax rate, giving rise to a tax credit of 25 cents in the dollar. The UK essentially had a two-stage removal of its imputation system, with changes made in 1997 and 1999.

After July 1997, imputation tax credits were no longer refunded to tax-exempt shareholders, such as pension funds. This reduced the theoretical value that tax-exempt investors placed on the dividend by 20 per cent from $1.25 to $1. In the UK, there was considerable outrage from pension funds as it had the effect of taxing their dividend income (Trapp 1997). The net effect of the changes were not as severe for individual investors or companies. However, Bell and Jenkinson (2002) show that the valuation of dividends did decline after the refunding of excess tax credits was removed in 1997. They contend that the cost of capital increased for UK firms. In contrast, Lasfer (2008) and Armitage et al. (2006) argue that the change in taxes did not affect the valuation of dividends.

A consultative document released by the UK government states that the removal of ACT was designed so that companies could make investment decisions without being influenced by the tax system (Bond et al. 1995; UK Government 1997). In effect, ACT was removed to encourage investment by companies, rather than the distribution of profits. In April 1999, ACT was scrapped and the tax credit was halved from 20 per cent to 10 per cent. Tax rates on dividend income were reduced, so that there was no net effect on UK individual shareholders (Tontsch 2002). The refunding of excess credits was also abolished. The 10 per cent credit was then granted irrespective of any whether any corporate tax has been paid on the profit (Tontsch 2002). As such, it is not an imputation system. It is important to note that the UK reduced the corporate tax rate from 33 per cent in 1996 to 30 per cent in 1999.

Ireland removed its imputation system in 1999, shifting to a classical tax system. It also drastically lowered its corporate tax rate from 32 per cent to 12.5 per cent. The developments in Ireland generally reflected those that took place in the UK. Ireland had been slowly reducing the rate of imputation from 25 per cent in 1994 to 11 per cent prior to the shift to a classical tax system.

Germany

In 2001, Germany removed its imputation tax system in favour of a 'half-income' system. Under this system, 50 per cent of the dividend is taxed at the investor's marginal rate, while companies do not pay tax on dividends. According to data from the OECD (2016), the net personal tax rate on dividends for a top bracket marginal investor declined from 31.1 per cent to 25.6 per cent after imputation was removed. The OECD (2007) also reports that Germany removed imputation in order to reduce the corporate tax rate from 30 per cent to 25 per cent. Endres and Oestreicher (2000) state that the reforms were designed to reduce corporate tax, increase Germany's international competitiveness, increase foreign investment and increase retained earnings. A further motivation was the desire to satisfy concerns that the European Court of Justice (ECJ) would rule that dividend imputation was discriminatory, reflecting the fact that foreign investors were generally unable to use the imputation credits. EU rules require non-discriminatory treatment of investors so that capital can move freely.[2]

The changes removed the preferential treatment of dividends over capital gains for domestic investors so that theoretically investors should have been indifferent between the two. In the process, the removal of imputation resulted in the theoretical value of $1 of dividends declining from approximately $1.43 to $1. However, McDonald (2001) uses a variety of techniques to show that around 50 per cent of the tax credit was valued by investors. Further, Haesner and Schanz (2013) find that after imputation is removed the value of a dividend declines by 15 cents in the dollar.

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Finland

The full imputation tax system was removed in January 2005 and replaced with a partial inclusion tax system where only a portion of the dividend is taxable. The taxable portion of the dividend was initially set at 57 per cent of the dividend, but has varied since. The tax rate levied on dividends paid to individuals initially increased from 0 per cent to 16 per cent after imputation was removed. The removal of imputation was accompanied by a decrease in the corporate tax rate from 29 per cent to 26 per cent. The changes to the tax system did not affect foreigners as a 15 per cent withholding tax continued to be levied on the majority of overseas investors (Korkeamaki et al. 2010). Tax-exempt domestic institutions were also unaffected as they were not eligible to receive any imputation tax credits.

According to Hietala and Kari (2006), the reform was driven by European factors rather than any Finland-specific factors. The ECJ had made it clear that it viewed imputation systems that provided tax credits only to domestic investors as discriminatory. In addition, Finland was concerned that some new entrants to the European Union (EU) had lower corporate tax rates, and that a number of incumbent EU countries were lowering their corporate tax rates around this time.

France

France abolished its full dividend imputation system in January 2005, under which the tax credit (*avoir fiscal*) was equal to 50 per cent of the face value of the dividend. It was replaced by a partial inclusion system where only 50 per cent of the dividend was subject to personal tax. For an investor on the top marginal tax rate, the effective tax rate on dividends increased from 29 per cent to just over 32 per cent. The corporate tax rate was lowered from 35.4 per cent in 2004 to 34.4 per cent in 2006. The removal of France's imputation system had an adverse impact on some foreign investors, as shareholders resident in certain countries that had a tax treaty with France could receive a refund of the imputation tax credits (HM Revenue and Customs 2010). The ECJ was the influential force in France's decision to remove dividend imputation because of discrimination against companies and residents of countries that did not have a tax treaty with France (Ernst & Young 2004).

Italy

Italy removed its dividend imputation system in December 2004. The corporate tax rate of 34 per cent in 2003 led to an imputation tax credit of 51.52 per cent. The IMF (2002) points out that the imputation credit was fully refundable to low-tax rate or tax-exempt shareholders. Under the imputation system, individual shareholders could elect to receive the imputation credit or pay a withholding tax of 12.5 per cent. Those shareholders with a marginal tax rate of less than 39 per cent would have been better off electing to pay the 12.5 per cent withholding tax, rather than taking the imputation credit, as it would have resulted in a lower tax bill.

The tax system that replaced imputation led to a 12.5 per cent withholding tax on ordinary dividends for the highest marginal tax rate shareholders. As such, the removal of imputation did not affect their after-tax value of dividends (IMF 2002). According to the OECD (2006), changes to the Italian tax system were intended to reduce both the company tax burden and the complexity of the tax system. Companies are taxed on only 5 per cent of the dividend, providing them with an effective tax rate of 1.65 per cent (Perin 2004). The corporate tax rate was reduced from 36 per cent in 2002 to 33 per cent in 2004. As with other European countries, the ECJ had a substantial influence on the decision to remove the imputation system in Italy.

Norway

Despite not being in the EU, there were concerns in Norway regarding the ECJ and their view on the preferential treatment of domestic shareholders relative to foreign shareholders (Report to the Storting 2011). There were also domestic factors at play. One concern was the significant difference in the tax rate on labour and capital, with labour income taxed at almost 65 per cent versus capital income at 28 per cent. This created an incentive for taxpayers to transform labour income into capital income (Sørensen 2005).

Norway operated an imputation system until January 2006, under which domestic investors did not pay any tax on dividends (Dai and Rydqvist 2009). Capital gains tax is complex, and in the interest of brevity we will ignore this complication. Under the current system dividends and capital gains do not attract tax in the hands of shareholders if they are below some benchmark rate, such as the average risk-free rate, termed the 'rate of return allowance' (Denk 2012). In this case only a 28 per cent corporate tax is levied. If the rate of return exceeds the benchmark, then the additional return is taxed at the personal level of 48 per cent (= 28% corporate tax + 28% personal tax on the remaining 72 %). There remains considerable debate about whether the new system removes or creates distortions for investors. Furthermore, the rate of return allowance creates an additional administrative burden for taxpayers (Report to the Storting 2011). Unlike many of the other European countries that removed dividend imputation, Norway did not reduce its corporate tax rate.

Singapore and Malaysia

Singapore and Malaysia are two non-OECD countries that have also removed full dividend imputation systems. Singapore's corporate tax rate of 24.5 per cent in 2002 gave rise to an imputation credit of 32 cents per $1 dividend (0.245 / 0.755). Singapore replaced imputation with the so-called one-tier corporate tax system in January 2003, under which tax was applied only at the company level and dividends became tax-exempt for shareholders (Hennig 2004). As part of the transition to the new tax system, Singapore allowed companies to distribute accumulated tax credits for up to five years, or until they had depleted their balance (Hennig 2004). This transition period was implemented to benefit individual shareholders (Teck 2006). There is also no capital gains tax in Singapore. Singapore reduced its corporate tax rate from 24.5 per cent in 2002 to 20 per cent in 2005, in conjunction with the removal of dividend imputation (KPMG 2007).

In its Economic Review Committee Report, the Singaporean Ministry of Trade and Industry (2002) put forward three reasons why imputation should be removed. First, it was noted that companies did not always have sufficient tax credits to frank the dividend, which led to lower company distributions. They argued that this created a disincentive for companies to use Singapore as a regional hub. Second, imputation led to higher compliance costs and was inflexible with respect to an increasing number of complex business transactions. Third, imputation reduced the ease with which new tax changes could be introduced.

Teck (2006) discusses the effect on shareholders in Singapore. Domestic shareholders with a marginal tax rate higher than the corporate tax rates were better off after the introduction of the single-tier system. Low marginal tax rate investors were adversely affected as they had previously been entitled to a refund of unutilised credits. Teck (2006) also argues that the removal of imputation could have left certain foreign investors worse off.

The removal of Malaysia's full imputation system mirrored that of Singapore in terms of both motivation and structure. Malaysia shifted to a single-tier system from January 2008 with a six-year transition period during which the imputation system continued to apply to certain companies. The corporate tax rate was reduced from 26 per cent in 2008 to 25 per cent in 2009 (Taxand 2007).

What are the lessons for Australia?

There are some notable differences between Australia and those countries that have removed imputation, as well as contrasts in their political and economic circumstances. However, there are considerable similarities in the imputation systems that countries had been operating. So, what can we learn?

Firstly, the ECJ has played a significant role in the shift away from dividend imputation in Europe. Based on the reasons provided for the removal of imputation by these countries, it is not clear that the mass removal would have taken place without the pressure from the ECJ, perceived or otherwise. The shift away from imputation thus seems to be motivated more by concern with anti-discriminatory taxing of shareholders than economic efficiency. In this sense, Singapore and Malaysia are notable exceptions as they clearly made 'voluntary' decisions to remove imputation.

For the most part, the reasons used to justify removing imputation overseas do not seem directly applicable to Australia. In addition to the role of the ECJ, other motivations have included improving investment (UK, Singapore), reducing cost and improving flexibility (Italy, Singapore), and tax rebalancing aimed at reducing the burden on individuals (Norway). While the impact on investment has been a focal point in Australia, the debate here contrasts with that in the UK where the motivation seems to have been to discourage high dividend payouts.

With the exception of Norway, all of the countries discussed above lowered the corporate tax rate at, or around, the time when imputation was removed. It is on this point that the overseas experience has its closest parallels with the debate in Australia, where removing imputation is seen as a way of potentially funding a lower corporate tax rate. It is also worth noting the transition period used in Singapore and Malaysia, as a means to allow for more orderly behaviour by companies and market participants.

It remains to be seen where the debate surrounding the removal of imputation in Australia will go from here. If the debate continues, there are two questions that will need to be addressed. What system might replace dividend imputation? Do we understand any potential unintended consequences from these different tax systems? The continued changes to how dividends are taxed by some of the countries that have removed imputation suggests that the answers to these two questions are not straightforward.

Despite attempts to make the shift away from imputation tax that is neutral from the shareholders' perspective, it is evident that in some countries certain shareholders were better off and others were worse off. The burden varied across investors, with tax exempt or low marginal tax rate investors in many countries being most adversely affected when the refunding of imputation credits ceased. Many of the countries that removed imputation have continued to alter their tax systems by either changing the rates, taxable proportions of dividends, or other rules. In contrast, dividend imputation in Australia has been stable for over decade.

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Notes

2. See Graetz and Warren (2007) for details on the ECJ and its role in dividend taxation.

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