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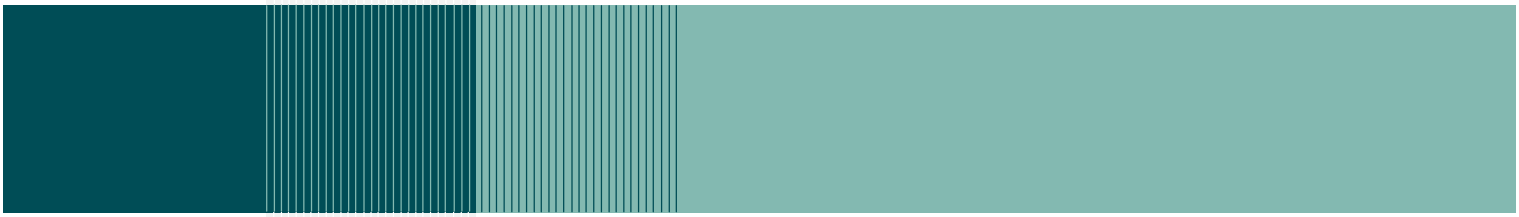
AER's Proposed WACC Statement - Gamma

A report for the Joint Industry Associations



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Executive Summary

In its proposed statement on the revised WACC parameters for electricity transmission and distribution businesses[1] (the Proposed Statement), the Australian Energy Regulator (AER) has adopted a value of 0.65 for gamma. This proposed value was adopted in light of the AER's finding that it was reasonable and appropriate to adopt a range for gamma of 0.57 – 0.74. This range was in turn derived by:

- assuming a payout ratio of imputation credits equal to one;
- establishing a lower bound for theta of 0.57, based on the AER's best estimate inferred from post-2000 market prices; and
- establishing an upper bound for theta of 0.74, theta based upon the AER's best estimate derived from tax statistics.

This report shows that the AER and its advisors have made a series of theoretical and methodological errors that have caused it to substantially overstate the value of gamma. When the market evidence is correctly interpreted, it demonstrates that the best estimate for the value of gamma is substantially less than 0.5 value that is currently adopted.

If the AER were to adopt a value for gamma of 0.65, the ensuing rate of return to investors would not be commensurate with prevailing conditions in the market for funds and the risk involved in providing prescribed transmission services or standard control services (as the case may be).[2]

Specifically, this report shows that:

- the AER is incorrect in finding that a dividend payout ratio of one is consistent with valuation theory in an imputation tax regime, since:
  - a firm's use of retained earnings to finance new projects to minimise the costs of raising expensive new equity leads to a build-up of franking credits that may not be paid out for many years so retained imputation credits have *little or no value* to investors; and
  - imputation credits retained by a firm cannot be reinvested by it and so must have less value to investors than imputation credits that are immediately distributed.

  Since retained imputation credits have little or no value to investors, gamma should continue to be defined as the product of an expected dividend payout ratio (F) and the market value of imputation credits distributed as a proportion of their face value (θ).

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1 AER, Electricity transmission and distribution network service providers - Statement of the revised WACC parameters (transmission) – Statement of regulatory intent on the revised WACC parameters (distribution): Proposed (the Proposed WACC Statement), December 2008.

AER, Electricity transmission and distribution network service providers – Review of the weighted average cost of capital (WACC) parameters: Explanatory Statement (the Explanatory Statement), December 2008.

2 We note the relevance of the the term "prevailing market conditions" given its use in clauses 6.5.2(b) and 6A.6.2(b) of the National Electricity Rules (NER).

Given that an assumption of a 100 per cent payout ratio will systemically under compensate equity owners, its value should be determined from empirical estimates. However, as the AER acknowledges in its Explanatory Statement that:[3]

> the prevalence of complex financial structures (e.g. trusts) among the privately owned firms in the energy utility sector may complicate the calculation of a payout ratio based on listed firms.
>
> As stated above, there are reasons to expect that an industry average payout ratio will differ from the market average. However, the AER accepts that it is not clear whether the industry average payout ratio will be higher or lower than the market average.

Given this conclusion in our opinion, a market average payout ratio should be adopted. The most recent and comprehensive estimate of the market payout ratio is 0.71 as provided by Hathaway and Officer.

- the AER is also incorrect in finding that the representative investor has characteristics that represent the weighted averages of the characteristics of all investors in the domestic market, including foreign investors, but only to the extent that they invest domestically, since:
  - the AER's characterisation implies that domestic and foreign investors face constraints in moving funds into and out of the Australian equities market, which clearly contradicts the facts – domestic and foreign investors are largely *free* to move funds into and out of the Australian equities market;
  - this characterisation of the representative investor contradicts the analysis of Brennan (1970) and Guenther and Sansing (2007); Brennan, and Guenther and Sansing demonstrate that the representative investor has characteristics that are wealth-weighted averages of all investors and not holdings-weighted averages of the characteristics of some investors; and so
  - the fact that foreign investors hold only about 30 percent of the market value of the ASX does not imply that foreign investors do not exercise considerable influence over the market value of imputation credits.

  The characteristics of the representative investor are a weighted average of the characteristics of all investors. This is true even if foreign investors' inability to redeem imputation credits discourages them from holding a large share of the domestic equity market. A representative investor is most likely to resemble a foreign investor because foreign investors have greater "weight" because their aggregate wealth exceeds the aggregate wealth of domestic investors by orders of magnitude.[4]

- the AER is incorrect in finding that the rate at which imputation credits are redeemed as tax credits can provide a reasonable estimate of the value of theta, since the:

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[3] AER, Explanatory Statement, page 302.

[4] This analysis does not presume that foreign investors are homogeneous. It does presume, though, that the combined wealth of all foreign investors exceeds the combined wealth of all domestic investors. We view domestic and foreign investors as distinct groups because, unlike their domestic counterparts, foreign investors either cannot redeem imputation credits or face difficulties in extracting much value from imputation credits.

- use of the redemption rate to estimate theta can ***substantially*** overestimate the impact of domestic shareholders in determining the value of franking credits; and
- use of the redemption rate does not take account of the *costs* to investors of accessing imputation credits.

Redemption rates are not a reasonable basis for estimating the market value of theta. Their use – even as the basis for establishing an upper bound - introduces a clear upward bias to the estimated value of gamma.

§ the AER is incorrect in finding that the July 2000 tax changes have increased the value of theta, since:

- the tax change increased the value of credits to some domestic investors but did not change the value of credits to other domestic investors or, more importantly, to foreign investors, who because of their wealth, we argue, effectively determine theta; so, *theoretically*, one would not expect there to have been an increase in the value of theta; and
- *empirically*, the studies on which the AER relies to exclude the pre-2001 data (ie, Handley and Maheswaran as well as Beggs and Skeels) do not provide a reasonable basis for that exclusion.

The significant imprecision involved in estimating theta from market data suggests that a more comprehensive data - that includes both pre and post-2001 data - should be used to estimate theta.

§ The AER accepts evidence from Australian drop-off studies that the market views a dollar of dividends as worth less than a dollar to determine theta. However, the AER says that it will not raise the returns required by regulated firms to reflect this evidence that dividends are not fully valued by the market because US studies find little cross-sectional relation between returns and dividend yields. If the AER will not raise the returns required by regulated firms to reflect evidence that dividends are not fully valued, then, to be consistent, it should determine theta either:

- from drop-off studies, imposing the constraint that dividends are fully valued; if it does so, it will estimate theta to be not statistically different from zero; or
- from an examination of whether a cross-sectional relation exists between returns and credit yields, imposing the constraint that dividends are fully valued; again, if it does so, it will find no evidence to support a positive value for theta.

The evidence from Australian drop-off studies and from an Australian study of the relation between returns and credit yields indicates that theta can be set to zero.

In our opinion, gamma should continue to be defined as the product of an expected payout ratio (F) and the market value of imputation credits distributed as a proportion of their face value (θ).

In the absence of a reliable industry average payout ratio, the AER should adopt a market average payout ratio. The most recent and comprehensive estimate of the market payout ratio is 0.71, as provided by Hathaway and Officer.

The value of theta (θ) should be estimated from dividend drop-off studies that use a comprehensive data set. Conditional on dividends being valued at less than their face value, these studies imply that the market value of distributed imputation credits is between 0.2 and 0.4. Conditional on dividends being fully valued, though, these studies imply that the market value of distributed imputation credits is zero. A zero value for gamma is also consistent with the evidence from current studies of the cross-sectional relationship between credit yields and returns.

1. Introduction

This report has been prepared at the request of the joint industry associations (JIA), which comprise the Energy Networks Association (ENA), Grid Australia and the Australian Pipeline Industry Association (APIA). It comments on the AER's Proposed Statement on the weighted average cost of capital (WACC) parameters for electricity distribution and transmission network service providers.[5]

Specifically, we have been asked to review the methodology used and conclusions drawn by the AER in estimating the value of imputation credits (gamma).[6] In addition, we have been asked to comment on the advice provided by Associate Professor John Handley, which is attached to the AER's Proposed Statement as Attachment G to the explanatory statement.[7]

The AER's post tax revenue model (PTRM) uses the value of 'gamma' to determine the proportion of benchmark company income tax that should not be included in a regulated firm's annual revenue requirement. Gamma represents the value that equity investors place on the franking credits created through the payment by firms of company income tax.

In developing this report we are cognisant that the following concepts, upon which we have views, are to be considered:[8]

> (1) the need for the rate of return calculated … to be a forward looking rate of return that is commensurate with prevailing conditions in the market for funds and the risk involved in providing *standard control services*; and
>
> (4) where … the values attributable to … parameters referred to in paragraph (d) cannot be determined with certainty:
>
> (i) the need to achieve an outcome that is consistent with the *national electricity objective*; and
>
> (ii) the need for persuasive evidence before adopting … a value for … that parameter that differs from the … value … that has previously been adopted for it.

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5 AER, Electricity transmission and distribution network service providers - Statement of the revised WACC parameters (transmission) – Statement of regulatory intent on the revised WACC parameters (distribution): Proposed (the Proposed WACC Statement), December 2008.

AER, Electricity transmission and distribution network service providers – Review of the weighted average cost of capital (WACC) parameters: Explanatory Statement (the Explanatory Statement), December 2008.

6 Clauses 6.5.3 and 6A.6.4 of the NER state that gamma is the *assumed utilisation of imputation tax credits*. Gamma has been correctly interpreted in the Issues Paper as the value of imputation credits. The value ascribed to gamma will affect the calculation of the return the market otherwise requires on equity. The higher is gamma, and so the greater the value the market places on franking credits, the lower will be the return the market otherwise requires in the form of cash dividends and capital gains on equity.

7 John C Handley, A Note on the Valuation of Imputation Credits: Report for the Australian Energy Regulator, 12 November 2008.

8 NER, clauses 6.5.4(e) and 6A.6.2(j).

For the purposes of sub-rule (4) above, we assume the "value that has previously been adopted" for gamma is 0.5.

In its Proposed Statement the AER suggests that the value of gamma be increased to 0.65. If this proposal were adopted, it would lower the revenue required to compensate businesses for the expected cost of company income tax.[9]

The remainder of this report is structured as follows:

- Chapter 2 reviews the issues raised by the AER and Handley on the payout ratio (F);
- Chapter 3 examines the arguments raised by the AER and Handley on the market value of distributed imputation credits (θ); and
- Chapter 4 sets out whether cross sectional studies provide evidence to support a positive value of gamma.

Appendix A sets out a theoretical example of the impact of foreign investors on the value of imputation credits. Appendix B provides an overview of the project team.

[9] AER, Electricity transmission and distribution network service providers - Statement of the revised WACC parameters (transmission) – Statement of regulatory intent on the revised WACC parameters (distribution): Proposed, December 2008, pages 6 and 7.

2. Payout Ratio (*F*)

2.1. Retention of Imputation Credits and Firm Value

In reaching its conclusion that the value of gamma should be revised to be 0.65 the AER adopted the analysis of Associate Professor John Handley that, for valuation purposes, it is appropriate to assume that 100 percent of a firm's free cash flows are distributed. Consequently, the AER indicates that, for each regulated firm, it intends to assume a payout ratio of imputation credits (*F*) equal to one.

Handley suggests[10] that this approach is consistent with:

> the standard WACC valuation framework (within a classical tax environment) due to Miller and Modigliani (1961), and which underlies standard valuation practices such as that formulated by McKinsey & Company, Inc. (2005) and Stewart (1991), but is also consistent with the valuation framework which underlies Officer's (1994) set of WACC definitions appropriate to the Australian imputation tax system.

Handley correctly states that the standard valuation practice in a classical tax environment is to make the simplifying assumption that all free cash flows are distributed.[11] This assumption is reasonable if retained free cash flows can be reinvested at the firm's cost of capital. This is because, under a classical tax system, if a firm reinvests retained free cash flows at a rate of return equal to the cost of capital, the firm's value will be independent of whether free cash flows are distributed or retained.

This proposition can be demonstrated with the following simple example. Consider a firm that will generate free cash flows of $263.80 per annum for 5 years. If the rate of return is 10 per cent, the firm will have a value of $1,000. If that firm reinvests the free cash flows from year 1 (ie, $263.80) into an additional asset that has an economic life of 4 years and generates an internal rate of return equal to 10 per cent (ie, $83.22 per annum) the firm will continue to have a value of $1,000. Table 2.1 shows the cash flows to investors, under each scenario.

Table 2.1
Example under a Classical Tax System

		Year				
	Present value	1	2	3	4	5
Scenario A	$1,000.00	$263.80	$263.80	$263.80	$263.80	$263.80
Scenario B	$760.18	$0.00	$263.80	$263.80	$263.80	$263.80
	$239.82	$0.00	$83.22	$83.22	$83.22	$83.22

[10] John C Handley, A Note on the Valuation of Imputation Credits: Report for the Australian Energy Regulator, 12 November 2008, page 5.

[11] Miller and Modigliani assume an ideal economy characterised by no transaction costs, no tax differentials between distributed and undistributed profits or between dividends and capital gains, no information asymmetries, competitive price-taking, and rational behaviour.

In this framework, under a classical tax system, the retention (or payout) policies of a firm will not affect its value. However, under an imputation tax system, the payout policy of a firm can affect its value. Postponing the distribution of free cash flows and the franking credits attached to them will reduce the value of the credits because retained credits cannot be invested by a firm to generate future revenues. Further, using retained earnings to finance new investment can also lead to the build up of unpaid credits (see Dempsey and Partington (2007)).[12]

Taking the above example, suppose the firm is able to distribute a fully franked dividend of $184.66 and $79.14 of imputation credits per annum. If one assumes that all investors benefit fully from imputation credits, the firm will be valued at $1,000. If the firm were to decide instead to reinvest the first year of its free cash flows (the dividend of $184.66) at a rate of return of 10 percent, the reinvested funds would generate $40.78 of fully franked dividends and an imputation credit of $17.48 each year for four years. As a result the firm's value would fall to $928.06 (ie, a fall of $71.94).

The $71.94 fall in the value of the firm reflects the fact that the imputation credit of $79.14 that was to have been paid out in year 1 is by year 5 still unpaid. This example illustrates the way in which the use of retained earnings to finance projects can lead to a storing up of unpaid franking credits. Here we assume that the credit is never paid out and so is lost. Alternatively, one might assume that it will be paid out at some date in the future, in which case, while the credit will not be lost, its value will be greatly diminished.

Table 2.2 shows the returns to investors under these two scenarios.

Table 2.2
Example under an Imputation Tax System

			Year				
		Present value	1	2	3	4	5
Scenario C	Dividends	$700.00	$184.66	$184.66	$184.66	$184.66	$184.66
	Credits	$300.00	$79.14	$79.14	$79.14	$79.14	$79.14
Scenario D	Dividends	$532.13	$0.00	$184.66	$184.66	$184.66	$184.66
	Credits	$228.06	$0.00	$79.14	$79.14	$79.14	$79.14
	Dividends	$117.51	$0.00	$40.78	$40.78	$40.78	$40.78
	Credits	$50.36	$0.00	$17.48	$17.48	$17.48	$17.48
	Total	$928.06					

[12] Dempsey, Michael and Partington, Graham, Cost of capital equations under the Australian imputation tax system, Accounting and Finance Vol 48 No 3, September 2008, page 445.

Of course, this analysis suggests that perhaps a firm should not use retained earnings to finance new investment but should instead raise new equity and pay a franked dividend sufficient to empty its franking account. However, while investors can use imputation credits to lower the taxes that they must pay, they will typically face taxes on the dividends that they receive. In addition, there are costs to raising new equity. Whether the firm should use retained earnings to finance new investment or raise new equity will depend on the magnitude of these costs and the benefits to shareholders of paying out imputation credits and reducing agency costs by disgorging free cash flows.

We also note that the AER when determining whether a firm requires compensation for equity raising costs presumes that a firm will first employ its free cash flows before raising new equity.

Since a dollar of imputation credits retained will not grow over time, equity owners will place a lower value on retained credits than those that are distributed immediately. This point is explicitly acknowledged by Handley in footnote 9 of his report:[13]

> There will, of course, be some time value loss associated with the retention of credits, however, subject to the franking rules, firms may choose to distribute retained credits at will – including by way of special dividend and share buy back arrangements. So whilst the current value of a retained credit ultimately depends on the expectation of when it is paid out, it is suggested here that the most appropriate assumption for valuation purposes is the one which is consistent with the standard cost of capital formulae i.e. assume a full distribution of free cash flow and therefore assume a full distribution of imputation credits. In contrast, the current approach reflected in equation (1) implicitly assumes retained imputation credits have zero value.

In the above statement, Handley explicitly acknowledges that retained imputation credits have a lower value than those immediately distributed. It follows that assuming that all imputation credits are distributed when created will lead to the value of gamma being overstated.

> Assuming a 100 percent payout ratio means that the value of gamma is overstated since retained imputation credits cannot be reinvested by the firm.

We address Handley's comments on the ability of regulated firms to distribute retained imputation credits in the following section.

[13] John C Handley, A Note on the Valuation of Imputation Credits: Report for the Australian Energy Regulator, 12 November 2008, footnote 9, page 5.

2.2. The Value of Retained Imputation Credits

The above analysis shows that the value of retained imputation credits must be less than those immediately distributed. Since imputation credits only have worth once they are attached to dividends, their present value will depend on the following two factors:

- the appropriate rate at which to discount retained imputation credits; and
- the period over which imputation credits are likely to be retained by a transmission or distribution network service provider.

Since franking credits must be attached to dividends to be paid out, the appropriate rate at which to discount retained imputation tax credits is at the required return to equity. Discounting by the return on equity will quickly diminish the value of retained credits:

Table 2.3
Value of Retained Imputation Credits

Period Retained	10.2% Return on Equity[a]	11.4% Return on Equity[b]	10.1% Return on Equity[c]
5 years	61.5%	58.3%	61.8%
10 years	37.9%	34.0%	38.2%
15 years	23.3%	19.8%	23.6%
25 years	8.8%	6.7%	9.0%

(a) Return on equity based on equity beta of 0.8 and risk free rate as recorded between 25 August 2008 and 25 November 2008 (ie, 5.4%).

(b) Return on equity based on equity beta of 1.0 and risk free rate as recorded between 25 August 2008 and 25 November 2008 (ie, 5.4%).

(c) Return on equity based on equity beta of 1.0 and average risk free rate in the 20 days to 27 January 2009 2008 (ie, 4.1%).

The second factor affecting the value of imputation credits is the time over which they are retained before being distributed by electricity transmission and distribution network service providers. In addressing this question, it is important to recognise that the payout ratio itself reduces the value of imputation credits created (through the payment of company income tax) to investors, because firms do not distribute all the imputation credits they create in a given year. In essence, a payout ratio of say 70 per cent implies that for each dollar of tax paid in a given year 70 cents is distributed to shareholders by way of franked dividends. While the value of theta then measures the value of those distributed imputation credits to the market.

Retained imputation credits will only be distributed when a firm is able to distribute more credits then it creates in a given year. In other words, only when in a year where a firm is able to distribute all the credits it creates is the firm able to distribute retained imputation credits and lower its franking credit balance. It follows that the payout ratio must be greater than 100 per cent before retained imputation credits are distributed.

There are a number of circumstances where a firm may be in a position to have a payout ratio of greater than 100 per cent, for example:

- where it has paid insufficient Australian income tax to fully frank the dividends paid in that year; or
- where a special dividend or off-market buyback is used by the firm.

The most common reason that an Australian firm does not pay sufficient Australian income tax to fully frank its dividends is that it has a foreign source of income. For example, the Westfield Group earns a substantial portion of its income from investments in the UK and USA and so does not create sufficient imputation credits to enable its dividends to be fully franked. Therefore, firms with foreign sourced income are able to distribute retained imputation credits with their normal declared dividend. However, a stand alone regulated Australian transmission or distribution electricity business does not have any foreign sourced income.

Retained imputation credits may also be attached to a special dividend declared by a firm out of its retained earnings.[14] In these circumstances, rather than profits being reinvested, a firm pays a special dividend so that the total amount paid in dividends is greater than the firm's annual profit. By paying a special dividend, the firm is effectively reducing the amount of equity invested in the business.

However, regulated firms are, to a large extent, constrained in their ability to reduce the level of equity in the regulated business since they are assumed to maintain the regulatory gearing level. The Proposed Statement makes the assumption that regulated electricity transmission and distribution businesses maintain a 60 per cent debt and 40 per cent equity capital structure. It follows that, as the regulatory asset base (RAB) of a firm increases the amount of debt and equity rises while, on the other hand, when the RAB falls the amount of debt and equity invested falls. Consequently, a firm will only pay a special dividend or undertake a share buy back (which reduces the amount of equity invested), when the value of its regulated assets falls.

Under the current regulatory regime, the value of regulatory assets falls when nominal depreciation is greater than the sum of indexation and new capital expenditure. However, an examination of the value of the regulated assets of electricity transmission and distribution network service businesses, which is reproduced in Table 2.4 below, highlights that there has been substantial growth as opposed to a fall in the RABs of all electricity network service providers.

This outcome is not surprising given that electricity networks must expand to provide services necessary to support an economy that is expected to grow into the foreseeable future. Since the appropriate discount rate is the return on equity and there is no foreseeable point when the RAB of electricity transmission and distribution network service providers will begin to fall, retained imputation credits have little or no value.

[14] Alternatively, a firm may undertake an off market buy back. However, in our opinion it is unclear whether this instrument can be used as suggested by the AER to stream dividends to domestic shareholders.

Other experts, for example, Cannavan, Finn and Gray, Hathaway[15] and Officer[16] and by ourselves,[17] assign a zero value to retained imputation credits and adopt the standard definition of gamma as the product of an expected payout ratio (F) and the market value of imputation credits distributed as a proportion of their face value (θ).

> The standard definition of gamma should be retained by the AER, ie, gamma is the product of an expected payout ratio (F) and the market value of imputation credits distributed as a proportion of their face value (θ).

[15] Cannavan D., Finn F. and Gray S., *The value of dividend imputation tax credits in Australia*, Journal of Financial Economics 73 (2004) 167-197.

[16] Hathaway and Officer, *The Value of Imputation Tax Credits*, Working Paper, 2 November 2004.

[17] NERA, The Value of Imputation Credits: A report for the ENA, Grid Australia and APIA, 11 September 2008.

Table 2.4
Nominal increase in RAB for Australian Electricity Network Service Provider's

Company	Year of decision	Opening RAB	Closing RAB	Compounded growth
Transmission				
Transend[18]	2003	570.00	844.00	6.8%
TransGrid[19]	2005	3,012.76	4,115.70	6.4%
Powerlink[20]	2007	3,752.83	6,483.58	11.6%
ElectraNet[21]	2008	1,265.06	1,875.48	8.2%
SP AusNet[22]	2008	2,191.20	2,673.00	4.1%
Distribution				
ActewAGL[23]	2004	510.54	567.86	2.2%
EnergyAustralia[24]	2004	4,115.87	5,709.65	6.8%
Integral Energy[25]	2004	2,215.83	3,229.46	7.8%
Country Energy[26]	2004	2,374.61	3,196.62	6.1%
Australian Inland[27]	2004	64.87	70.85	1.8%
Energex[28]	2005	4,308.10	6,745.40	9.4%
Ergon[29]	2005	4,198.20	6,696.80	9.8%
ETSA Utilities[30]	2005	2,466.00	2,771.74	2.4%
AGL[31]	2005	578.40	679.36	3.3%
Citipower[32]	2005	990.90	1,290.07	5.4%
Powercor[33]	2005	1,626.50	2,161.19	5.8%
SP AusNet[34]	2005	1,307.20	1,729.09	5.8%
United Energy[35]	2005	1,220.30	1,456.76	3.6%
Aurora Energy[36]	2007	981.11	1,159.47	3.8%

18 ACCC, Tasmanian Transmission Network Revenue Cap 2004-08/98, Dec 2003, p. 27.

19 NSW and ACT Transmission Network Revenue Cap: TransGrid 2004-05 to 2008-09, April 2005, p. 179.

20 AER, Powerlink Queensland transmission network revenue cap 2007-08 to 2011-12, June 2007, p. 138.

21 AER, ElectraNet transmission determination 2008-09 to 2012-13, April 2008, p. 103.

22 AER, SP AusNet transmission determination 2008-09 to 2013-14, Jan 2008, p. 7.

23 ICRC, Investigation into prices for electricity distribution services in the ACT: Final Decision, March 2004, p. 55.

24 IPART, NSW Electricity Distribution Pricing 2004/05 to 2008/09: Final Report, June 2004, p. 245.

25 Ibid. p. 253.

26 Ibid. p. 261.

27 Ibid. p. 271.

28 QCA, Regulation of Electricity Distribution, April 2005, p. 93.

29 Ibid. p. 93.

30 ESCOSA, 2005-2010 Electricity Distribution Price Determination: Part A – Statement of Reasons, April 2005, p. 124.

31 ESC, Electricity Distribution Price Review 2006-10 Final Decision Volume 1: Statement of Purpose and Reasons, Oct 2005, p. 620.

32 Ibid. p. 638.

33 Ibid. p. 658.

34 Ibid. p. 678.

35 Ibid. p. 696.

36 Office of the Tasmanian Energy Regulator, Investigation of Prices for Electricity Distribution Services and Retail Tariffs on Mainland Tasmania: Final Report and Proposed Maximum Prices, Sep 2007, p 237.

2.3. The Payout Ratio of Regulated Electricity Networks

In our report prepared in response to the AER's issues paper we explained that, while Officer's WACC framework suggests that one should use a firm specific measure of the distribution ratio, Australian regulatory practice adopts the principle that a regulated firm's cost of capital should be based on a benchmark firm.

However, there are a number of practical problems with developing a benchmark industry payout ratio from a sample of listed Australian regulated utilities. Specifically, listed Australian regulated utilities:[37]

- use complex financial structures such as trusts and stapled securities to distribute dividends that effectively represent a return of capital; and
- are unlikely to be representative of the benchmark network service provider since there are strong differences in terms of capital expenditure growth rates.

In its Proposed Statement the AER accepts that the prevalence of complex financial structures complicates the calculation of the payout ratio of listed firms and concludes that:[38]

> … it is not clear whether the industry average payout ratio will be higher or lower than the market average.

In light of this conclusion, with which we agree, in our opinion it would be appropriate to continue to use the historical market average payout ratio, which was estimated to be 0.71 by Hathaway and Officer.[39]

> The most appropriate estimate of the payout ratio for both electricity transmission and distribution network service providers is the estimate of the market average payout ratio of 0.71 provided by Hathaway and Officer.

[37] Note that only 2 of the 7 companies (AGL and United Energy) included in Envestra's sample are electricity network service providers.

[38] AER, Electricity transmission and distribution network service providers – Review of the weighted average cost of capital (WACC) parameters: Explanatory Statement, December 2008, page 302.

[39] Hathaway and Officer, *The Value of Imputation Tax Credits*, Working Paper, 2 November 2004

2.4. Consistent Regulatory Payout Ratio

In its Explanatory Statement the AER recognises that consistency between gamma and the market risk premium is an important consideration.[40]

We note that the across-the-board use of a market payout ratio would also ensure consistency between the value of gamma and the value of imputation credits used to determine the market risk premium.[41]

The consistency of the assumed payout ratio also extends beyond the WACC parameters and should be carried into other areas of an electricity network service provider's revenue determination framework. Specifically, the AER is required to make a dividend assumption when it assesses whether a firm has a need to raise additional debt and/or equity from the capital markets to fund its capital expenditure programme. Where the AER finds that the firm cannot fund its capital expenditure programme from its free cash flows, it provides an additional allowance for debt and/or equity raising costs. Therefore, consistency requires that the assumed dividend yield used to assess debt and equity raising costs should be "at least sufficient" to deliver the value of imputation credits assumed in the post-tax revenue model. In other words, the dividends must be sufficient to frank 71 per cent of imputation credits generated in the year.

> The adoption of a market payout ratio will also ensure consistency between the value of gamma and the value of imputation credits used to determine the market risk premium.
>
> Consistency requires that the dividend that the AER assumes in other areas of an electricity network service provider's revenue determination framework is sufficient to frank a fraction of imputation credits generated equal to the market payout ratio.

[40] AER, Electricity transmission and distribution network service providers – Review of the weighted average cost of capital (WACC) parameters: Explanatory Statement, December 2008, page 336.

[41] In our earlier report we concluded that there is a single market value for theta (θ). This conclusion is consistent with the analysis undertaken by Guenther and Sansing. If theta were not identical across stocks, investors would face an incentive to shift funds from high-theta stocks to low-theta stocks to capture the additional return that would be offered by low-theta stocks. Consequently, if a market average payout ratio is adopted, the value of gamma should equal the value of imputation credits used to determine the market risk premium.

3. Market Value of Distributed Imputation Credits (*θ*)

In its Explanatory Statement the AER concludes that the market value of distributed imputation credits (theta) is between:[42]

- 0.57, which is the AER's best estimate of theta inferred from market prices; and
- 0.74, which is the AER's best estimate of theta from tax statistics.

However, in reaching this preliminary position the AER and its consultant Associate Professor John Handley have made a number of material errors, including:

- in their theoretical analysis of how imputation credits are likely to be valued and, in particular, in their analysis of the impact of foreign investors on theta;
- in their use of tax statistics to estimate the value of distributed imputation credits;
- in their rejection of the use of pre-2001 data in empirical studies on the value of theta; and
- in their dismissal of the results of dividend drop-off studies.

Each of these issues is discussed in greater detail below.

3.1. Theoretical Analysis

In its Explanatory Statement the AER summarises the responses to the theoretical issues concerning theta raised in response to its issues paper. The AER notes that the JIA's use of domestic data in estimating WACC parameters implicitly recognises the presence of domestic and foreign investors in the Australian equities market.

The AER then states that:

> Implicitly therefore, the JIA accept the AER's proposed approach to adopt a domestic form of the CAPM with foreign investors recognised to the *extent they invest* in the Australian market. [**Emphasis added**]

This statement misunderstood why the JIA accepts the use of domestic data. The use of domestic data implicitly accepts that a domestic form of the CAPM should be used, but with foreign investors recognised to the *extent they influence* the Australian market. In other words, the JIA recognises that the actions of foreign investors will have an impact on WACC parameters like the risk free rate, the cost of debt, the market risk premium and the value of gamma.

The influence of foreign investors on these WACC parameters is not limited, though, by the extent to which they currently invest in the Australian equities market. Rather, the potential for foreign investors to enter the Australian equities market means that this group can exert a

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[42] AER, Electricity transmission and distribution network service providers – Review of the weighted average cost of capital (WACC) parameters: Explanatory Statement, December 2008, page 339.

large influence on prices in the market even if their current holdings of Australian equities are low. A simple numerical example will help to illustrate this point.

3.1.1. An example

The example uses a simple general equilibrium version of Wood's (1997) model.[43] A full description of the model appears in Appendix A. The model assumes that there are two countries, a single currency and two assets in positive net supply:

- one domestic risky asset; and
- one foreign risky asset.

We assume that the foreign country is much larger than the domestic country, both in terms of its wealth and the number of shares traded in its asset. On the other hand, we assume that a domestic investor and a foreign investor have the same attitude towards risk.

With this model we examine two scenarios. In the first, there are no franking credits. Aside from differences in their levels of wealth, the domestic and foreign investors are identical, and so each investor holds the same portfolio. As a result, the foreign investor holds the majority of domestic shares and also the majority of foreign shares.

In the second scenario, the domestic asset delivers a franking credit of 2 percent per annum to shares held by the domestic investor, but no credit to shares held by the foreign investor. This discriminatory tax policy is sufficient to discourage the foreign investor from holding any of the domestic assets. The equilibrium in this scenario involves the domestic investor holding only the domestic asset and the foreign investor holding only the foreign asset. The required with-dividend return to the domestic asset will fall because of the subsidy provided by the credit. In our numerical example, though, it falls by only 0.09 percent per annum, which represents a small fraction of the value of the credit the asset delivers.

One way of understanding why the impact on the return required on the domestic asset can be so low is to think about what would happen if the credit were to be removed. In our example, a removal of the credit would be sufficient to propel the domestic investor away from holding all of her wealth in the domestic asset. Only a small increase, though, in the return offered on the asset would be required to attract sufficient funds from the foreign investor to replace the funds withdrawn by the domestic investor. The increase need only be small because the foreign investor is so much wealthier than the domestic investor.

This example illustrates the fact that, even in a world where no domestic shares are held by the foreign investor, the potential of the foreign investor to enter the market can have a significant impact on domestic prices. In particular, the potential of the foreign investor to enter the market can have a substantial impact on the market value of the franking credits the domestic asset delivers. The example also suggests, of course, that relying on utilisation rates to infer the value of franking credits can produce very misleading results. In other words, the

[43] Wood J., A Simple Model for Pricing Imputation Tax Credits Under Australia's Dividend Imputation Tax System, Pacific-Basin Finance Journal 5, 1997, 465-480.

example suggests that it is quite unsafe to rely on the rate at which imputation credits are redeemed as an estimate of their value. We will return to this issue shortly.

3.1.2. Identity of the representative investor

In our earlier report submitted to the AER[44], we emphasise that the impact of imputation credits on the returns required on assets delivering the credits will be determined by the ability of a representative investor to use them. We further emphasised that if there are no barriers to international investment in equities, besides a constraint on the ability of foreign investors to use franking credits, the representative investor will most closely resemble a foreign investor because foreign investors have substantially more wealth. This will be true even if foreign investors hold few domestic assets because of their inability to use the credits the assets deliver. Handley also recognises the importance of a representative investor. He states:[45]

> it is somewhat misleading, within the CAPM framework, to talk of the marginal investor since all investors collectively determine the prices of all assets and therefore all investors are collectively "the marginal investor". In this case, the equilibrium value of an asset does not depend on the level of risk aversion of any single individual investor, but rather depends on the aggregate level of risk aversion in the economy as a whole. This in turn represents a complex weighted average of the level of risk aversion of all investors in the market – with the weights based on individual levels of wealth. The weighted average investor is often called the representative investor.

Handley goes on, though, to say that the representative investor:[46]

> is by definition equal to a weighted average over all investors in the domestic market, including foreign investors but only to the extent that they invest domestically. [**emphasis in original**]

Our numerical example presented above shows that this interpretation of the characteristics displayed by the representative investor is quite wrong. In our example, the foreign investor holds no domestic assets but a representative investor still most closely resembles a foreign investor.

Handley further states that:[47]

> The holdings of foreign assets by foreign investors (and equally the holdings of foreign assets by domestic investors) are outside the model and so should be ignored in determining the weights attributed to each investor.

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[44] NERA, The Value of Imputation Credits: A report for the ENA, Grid Australia and APIA, 11 September 2008.

[45] John C Handley, A note on the Valuation of Imputation Credits: Report for the Australian Energy Regulator, 12 November 2008, page 7.

[46] John C Handley, A note on the Valuation of Imputation Credits: Report for the Australian Energy Regulator, 12 November 2008, page 7.

[47] John C Handley, A Note on the Valuation of Imputation Credits: Report for the Australian Energy Regulator, 12 November 2008, page 21.

This assertion directly contradicts the analysis of Brennan (1970) and Guenther and Sansing (2007).[48] Guenther and Sansing, who provide a careful analysis of Brennan's model, point out that the tax penalty on dividends will depend on a wealth-weighted average of tax rates across all investors, not a holdings-weighted average. Guenther and Sansing point out that in Brennan's model there is a single dividend tax penalty that reflects the tax rates of all investors. There is not a different tax penalty for each firm that is affected by the fractions of the firm's stock held by taxable investors and tax-exempt investors. Since imputation tax credits can be viewed as negative personal taxes on dividends, the analysis of Guenther and Sansing also indicates that the benefit associated with franking credits will depend on a wealth-weighted average of tax rates across all investors, not a holdings-weighted average across investors holding shares that deliver franking credits. Intuitively, by discounting the wealth that foreign investors hold outside Australia, Handley assumes that foreign investors are constrained in their ability to enter the domestic market.

The assumption that domestic and foreign investors face constraints in moving funds into and out of the Australian equities market clearly does not match what one observes.[49] Investors are largely free to shift wealth between domestic equities and foreign equities. There are few barriers facing Australians who wish to invest in the larger and more developed international equity markets and there are few barriers facing investors from these markets who wish to invest in the Australian equity market.

Handley's incorrect characterisation of the representative investor leads him to rely on imputation utilisation rates derived from tax statistics to determine the market value of imputation credits. However, our numerical example illustrates that relying on utilisation rates derived from tax statistics to determine the market value of imputation credits can be extremely misleading. We address this issue in more detail in the next section.

> The AER's characterisation of the representative investor directly contradicts the analysis of Brennan (1970) and Guenther and Sansing (2007).
>
> The fact that foreign investors hold only about 30 percent (directly) of the market value of the ASX does not imply that they do not exercise considerable influence on the value of imputation credits.
>
> The representative investor has characteristics that are a wealth weighted average of the characteristics of all investors. A representative investor is most likely to resemble a foreign investor because foreign investors have aggregate wealth that exceeds the aggregate wealth of domestic investors by orders of magnitude.

[48] Guenther, David A. and Richard Sansing, *The effect of tax-exempt investors on stock ownership and the dividend tax penalty*, Working Paper, Dartmouth College, NH, 2007.

[49] Similarly, Handley excludes the wealth of domestic investors held in foreign assets.

3.2. Use of Tax Statistics

In our earlier report prepared in response to the AER's Issues Paper we set out the reasons why the fraction of imputation credits redeemed will not equal the market value of imputation credits. Notwithstanding this analysis, in its Proposed Statement the AER has accepted that a reasonable estimate of theta can be inferred from tax statistics.[50]

Handley explains that the measure that he constructs with Maheswaran is:[51]

> … a simple average of utilisation rates across investors rather than a (complex) weighted average [but that] assuming the set of investors is indicative of the set of investors in the domestic market portfolio, this estimate may be interpreted as a reasonable upper bound on the value of gamma [**and theta**].

Our numerical example shows that the utilisation of credits does not provide an estimate of the value of theta. Again, in the example we provide above, all imputation credits are redeemed by domestic investors and the credit yield is 2 percent per annum, yet eliminating (introducing) the credit raises (lowers) the return to the domestic asset by just 0.09 percent.

There are at least two necessary conditions for imputation utilisation rates to be a reasonable estimate of the market value of imputation credits, ie:

- imputation credits must be allocated to investors on the basis of their wealth; and
- investors must incur no costs to accrue imputation credits.

As we explain below, neither of these conditions are met.

3.2.1. Allocation of imputation credits

The rate at which imputation credits are redeemed is the ratio of the imputation credits used by investors to the imputation credits distributed. Consequently, redemption rates are a weighted average of an investors' holdings, rather than investors' wealth. Handley claims that this is a "simple average" of utilisation rates across investors. However, the redemption rate is more correctly defined as a weighted average across investors with the weights determined by the proportion of imputation credits received. In other words, those investors that own shares that pay a high level of imputation credits (for example, owners of Commonwealth bank shares)[52] have a greater weighting than investors that own shares that pay a low level of (or no) imputation credits (for example, owners of QBE Insurance Group or, more importantly, of IBM)[53].

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[50] AER, Electricity transmission and distribution network service providers – Review of the weighted average cost of capital (WACC) parameters: Explanatory Statement, December 2008, page 338.

[51] John C Handley, A Note on the Valuation of Imputation Credits: Report for the Australian Energy Regulator, 12 November 2008, page 8.

[52] Using the closing price on 7 January 2009, Commonwealth Bank had a dividend yield of 9.2% fully franked, which equates to an imputation yield of 3.9%.

[53] Using the closing price on 7 January 2009, QBE Insurance Group had a dividend yield of 4.7% fully franked, which equates to an imputation yield of 1.0%. IBM does not issue imputation tax credits.

As we discussed in section 3.1, this "simple average" plays no role in the analysis of Brennan (1970)[54] and Guenther and Sansing (2007)[55].

If a wealth-weighted average were constructed rather than a "simple average", the resulting estimate would be much lower because the wealth of foreign investors is substantially greater than that of domestic investors.

3.2.2. Costs of accruing imputation credits

The AER was persuaded by Handley that the costs associated with accessing imputation credits are not relevant in the context of a domestic market portfolio:[56]

> Non market assets, including assets held by any of the investors in other markets are outside the model and therefore play no role in the pricing of domestic assets.

The cost that domestic investors incur from holding a portfolio heavily weighted with high-credit-yield domestic equities is that they must bear more risk than they would otherwise bear if they were to diversify internationally. A portfolio heavily weighted with high-credit-yield domestic equities may have a higher return for a domestic investor who is able to use the imputation tax credits thrown off, but the portfolio will be riskier than an internationally diversified portfolio.

While a model that assumes that the Australian equity market is segmented from international equity markets may provide no formal role for the foreign assets that domestic and foreign investors hold, their existence in practice will affect the value of imputation tax credits. Their existence in practice will affect the value of imputation credits because there is ample evidence that the Australian equity market is not segmented from international equity markets.

Although Handley is correct in saying that there is evidence that the explicit barriers to international investment that some countries (typically emerging markets) have erected have segmented their equity markets from international equity markets (see Bonser-Neal, Brauer, Neal and Wheatley (1990)), it is difficult to see what explicit barriers exist that would segment the Australian equity market from the major international equity markets.[57] It is difficult to see what barriers exist besides the discriminatory policy of precluding foreign investors from redeeming franking credits, the pricing effects of which, or lack thereof, is the focus of this report.

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[54] Brennan, Michael, 1970, Taxes, market valuation and corporate financial policy, National Tax Journal 23, 417-427.

[55] Guenther, David A. and Richard Sansing, *The effect of tax-exempt investors on stock ownership and the dividend tax penalty*, Working Paper, Dartmouth College, NH, 2007.

[56] John C Handley, A Note on the Valuation of Imputation Credits: Report for the Australian Energy Regulator, 12 November 2008, page 21.

[57] Bonser-Neal, Catherine, Gregory Brauer, Robert Neal and Simon Wheatley, International investment restrictions and closed-end country fund prices, Journal of Finance, 1990.

3.2.3. Conclusion

Handley's note on the value of imputation credits to the AER asserts that estimates of redemption rates of imputation credits may be interpreted as a reasonable upper bound on the value of theta. This conclusion goes significantly beyond the conclusion that Handley reaches in the study he published with Maheswaran:[58]

Redemption rates will overestimate the value of theta because they do not take into account the impact that foreign investors have on value and because the rates do not take into account the costs to investors of accessing credits. For these reasons the value the market places on a distributed imputation credit cannot be inferred directly from the fraction of the credits that are redeemed.

> Redemption rates will over-estimate the value of theta because a disproportionate weight is placed on domestic shareholders.
>
> Redemption rates do not take into account the costs to investors of accessing high levels of imputation credits.
>
> Redemption rates cannot provide a reasonable estimate of the value of theta and should be excluded from the analysis.

[58] See the conclusion of the Handley J. and Maheswaran K., A Measure of the Efficacy of the Australian Imputation Tax System, The Economic Record, Vol 84 No 264, March 2008, page 93.

3.3. Rejection of Pre-2001 data

The AER concludes that pre-2001 data should be excluded from consideration in estimating theta. The AER's reasoning for rejecting pre-2001 data is flawed, for the following reasons:

- there is no conceptual reason to believe that the July 2000 tax changes would have changed the market value of imputation credits;
- the Handley and Maheswaran study of tax statistics cannot be relied on to provide a market value for imputation credits and so cannot provide any insight into the impact of the July 2000 tax changes; and
- the Beggs and Skeels study that tested for a structural break between 2000 and 2001 – 2004 relies on an anomalous result in 2000.[59]

Each of these issues is addressed in turn.

The AER argues that there is a clear conceptual reason that the value of imputation credits to the "representative investor' in the Australian capital market will have increased following the July 2000 tax changes. The AER makes this argument because the July 2000 tax changes effectively allowed all domestic investors to access a cash rebate for credits received in excess of income tax liabilities. Since the AER views a representative investor as essentially a domestic investor, they argue that this change must have increased the average value of credits to the investor.

As discussed in section 3.1, the AER's characterisation of the representative investor contradicts the analysis of Brennan (1970) and Guenther and Sansing (2007). The representative investor will most likely resemble a foreign investor because foreign investors have an aggregate wealth that exceeds the aggregate wealth of domestic investors by orders of magnitude. For this reason, the July 2000 tax changes would be expected to have had, at most, a minimal impact on the value of theta. It follows that the presumption should be to include all available data so as to maximise the precision with which one estimates theta.

In addition to this conceptual reasoning, the AER also examines a number of studies to assess whether there is any empirical evidence of a structural break in the value of theta after July 2000. The first study examined by the AER is undertaken by Handley and Maheswaran, on the rates at which imputation credits are redeemed.[60]

In section 3.2 we set out the reasons why observing the rate at which imputation credits are redeemed by investors will not provide a reliable estimate of the market value of theta. Redemption rates will substantially overestimate the value of imputation credits because they largely ignore the impact that foreign investors have and fail to consider the costs to domestic

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[59] Note that on page 248 Beggs and Skeels indicate that the test for a structural break compared the periods between 1998-2000 and 2001-2004. However, Table 5 which sets out their results for franking credit drop-off ratios tests for a structural break between 2000 and 2001-2004.

[60] Handley J. and Maheswaran K., *A Measure of the Efficacy of the Australian Imputation Tax System*, The Economic Record, Vol 84 No 264, March 2008.

investors of accessing credits. It follows that any conclusions that rely on studies of redemption rates are unsound.

Finally, the AER considered the dividend drop-off study undertaken by Beggs and Skeels.[61] The AER notes:[62]

> that the increase in theta over the period has been determined as statistically significant by the authors. In addition, as shown in table 10.6, Beggs and Skeels' separate estimates of theta for each individual year provide further support for an increase in theta in the post 2000 period, and the value of cash dividends remained relatively stable at around 0.80

While Beggs and Skeels test for a structural break in the value of theta between 2000 and the 2001-2004 period, the reported 2000 estimates are anomalous because they suggest that an investor values a dollar of dividends at $1.17. In contrast, in all other periods Beggs and Skeels estimate that investors value cash dividends at less than their face value. Given the anomalous 2000 estimate, Beggs and Skeels conclusion of a statistically significant break is questionable.

We also note that if one disregards the year 2000 estimates, the increase in the value of theta in the 2001-2004 period is not statistically significant.[63] Consequently, the Beggs and Skeels study provides little evidence that pre-2001 data should be excluded.

To conclude, a change in the imputation tax system that increases the value of credits to domestic investors is unlikely to increase the value of theta because the tax change does not affect foreign investors whose aggregate wealth substantially exceeds the aggregate wealth of domestic investors. Furthermore, neither the Handley and Maheswaran study of the redemption rates of imputation credits nor the Beggs and Skeels dividend drop-off study provide any compelling evidence to conclude that the value of theta changed in 2000.

> The AER's theoretical analysis incorrectly leads it to conclude that the July 2000 tax changes should lead to an increase in the value of theta. Moreover, the studies relied on by the AER to exclude pre-2001 data provided no reasonable basis for excluding pre-2001 data.
>
> The inherent noise associated with estimates of theta presents a strong reason to estimate theta using a comprehensive data set that includes both pre and post-2001 data.

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61 Beggs and Skeels, *Market arbitrage of cash dividends and franking credits*, The Economic Record, vol.82, no.258, September 2006.

62 AER, Electricity transmission and distribution network service providers – Review of the weighted average cost of capital (WACC) parameters: Explanatory Statement, December 2008, page 317.

63 The estimate of theta from 2001-2004 is within a single standard error of the estimate from 1998-99.

3.4. Interpretation of Drop-Off Studies

Handley cautions against drawing conclusions from dividend drop-off studies. He cites a study by Michaely and Vila (1995), that Allen and Michael (2003) reference, and notes that the study suggests that:[64]

> the drop-off should reflect not just the impact of differential taxes but also the risk involved in trading around the ex-dividend date.

As we explain later, subsequent studies by Michaely et.al. not cited by Handley confirms that while risk will play a role in determining the ex-dividend day behaviour of stock prices its impact is negligible compared with the average dividend payment.

Michaely and Vila (1995) use a highly stylised model in which there is a risk-free asset and a *single* stock and in which the risk of holding the stock plays an important role in determining the ex-dividend day behaviour of stock prices. Handley notes that in this model the drop-off on the day a stock goes ex-dividend reflects:[65]

> (i) a complex weighted average of the differential tax rates of all investors in the market (with the weights based on individual levels of risk aversion); and
> (ii) the variance of the ex-dividend stock price.
>
> The adjustment for risk is to always reduce the drop-off relative to the amount of the dividend.

For this reason, Handley argues that it can be difficult to infer the value of franking credits from ex-dividend day studies.

In Michaely and Vila's (1995) model, when an investor buys the stock, they finance the purchase by drawing down an investment in the risk-free asset. When the investor sells the stock they invest the proceeds in the risk-free asset. Trading the stock therefore necessarily changes the risk of the investor's portfolio. This is why, in Michaely and Vila's (1995) model, risk (measured by variance of return) can have an impact on the ex-dividend day behaviour of prices. In practice, an individual or institution purchasing a stock around its ex-dividend day may sell another stock to finance the purchase and an individual or institution selling a stock around its ex-dividend day may invest the proceeds in another stock. If investors behave in this way, the impact of risk on the ex-dividend day stock price may be small because the risk of the investor's portfolio may barely change when she undertakes a trade.

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[64] John C Handley, A Note on the Valuation of Imputation Credits: Report for the Australian Energy Regulator, 12 November 2008, page 9.

[65] John C Handley, A Note on the Valuation of Imputation Credits: Report for the Australian Energy Regulator, 12 November 2008, pages 9-10.

Michaely, Vila and Wang (1996), in work that Handley does not cite, provide a model in which investors hold *diversified* portfolios of stocks around ex-dividend days. In Michaely, Vila and Wang's (1996) model:[66]

> the tax-adjusted CAPM holds, so that stock prices depend only on ... market risk ... and not on idiosyncratic risk ... [The model] is similar to what has been derived by Brennan (1970)

Although, the model that Michaely, Vila and Wang (1996) use is a two-period model – there is a single cum-dividend day and a single ex-dividend day – the model can easily be extended (for pricing purposes) to a more realistic setting, in which there are multiple cum-dividend days and multiple ex-dividend days. For each investor, on each day, optimality conditions must hold over each horizon - see, for example, Hansen and Singleton (1982).[67] In other words, in assessing what portfolio of stocks to hold each day, each investor will examine the entire term structure of expected returns to each stock. Investors will not only look one day ahead, they will look, for example, one week ahead, one month ahead and one year ahead. From the investor's optimality conditions, one can derive pricing relations that must hold over each horizon and over each future period. In particular, one can derive a pricing relation that must hold on the day a stock goes ex-dividend. This will be true even if the tax system effectively precludes holding a share of stock for one day. In this way, from a model like the model Michaely, Vila and Wang use, one can derive a pricing relation, like Brennan's (1970) model, that must hold on the day a stock goes ex-dividend.

So risk *will* play a role in determining the ex-dividend day behaviour of stock prices – but a *very, very small* role. A reasonable estimate of the daily market risk premium is two and a half basis points. It follows that the impact of risk on the mean return to a stock with a beta of one on the day the stock goes ex-dividend will be to raise the stock's mean return by two and a half basis points. The average dividend that a company pays out, on the other hand, is conservatively around 2 percent of the value of its equity or 200 basis points.[68] Thus the average dividend that a stock pays is an order of magnitude larger than the impact of risk on a stock's mean return on the day the stock goes ex-dividend. So Michaely, Vila and Wang's (1996) model suggests that the impact of risk on the behaviour of a stock's price on the ex-dividend day will be negligible.[69]

In Brennan's (1970) model the tax penalty on dividends and the benefit that arises from imputation tax credits is a complicated function of individual tax rates. The function, though, depends only on the attitudes of investors to risk and on their wealth. As Guenther and

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66 Michaely, R., J-L. Vila and J. Wang, A Model of Trading Volume with Tax-Induced Heterogeneous Valuation and Transaction Costs, Journal of Financial Intermediation 5, page 350.

67 Hansen, L.P, and K. J. Singleton, Generalized Instrumental Variables Estimation of Nonlinear Rational Expectations Models, Econometrica 50, page 1272.

68 We note that most Australian companies pay two dividends a year, it follows that our example implies an annual dividend yield of around 4 per cent. While this is lower than the current annual dividend yield on the Australian Stock Exchange a higher dividend payment further diminishes the role of risk in determining the ex-dividend day behaviour of stock prices.

69 A separate issue – and one that does not concern us here – is what impact risk has on the volume of trade around the time a stock goes ex-dividend. Michaely, Vila and Wang (1996) and Michaely and Vila (1996) investigate this issue. See Michaely, R. and J-L. Vila, Trading Volume with Private Valuation: Evidence from the Ex-Dividend Day, Review of Financial Studies 9, 471-510.

Sansing (2007) emphasize and we repeat, the function does not depend on how much of each stock is held by each investor. If the function were to depend on the proportion of each stock held by each investor, there would be opportunities for investors to improve their welfare by reallocating their wealth across stocks. Because the function depends only on the attitudes of investors to risk and on their wealth, the tax penalty on dividends and the benefit that arises from imputation tax credits should be no different around the time a stock goes ex-dividend than at other times. In other words, although an estimate of the benefit that arises from imputation tax credits, inferred from drop-off studies, is a complicated function of individual tax rates – at least within Brennan's framework and Michaely, Vila and Wang's (1996) framework – the estimate is precisely the right function for assessing the impact of imputation tax credits on returns.

> The model that Michaely, Vila and Wang (1996) provide suggests that the impact of risk on the ex-dividend day behaviour of returns will be negligible.
>
> The model that Michaely, Vila and Wang (1996) provide also suggests that an estimate of theta derived from drop-off studies will provide the right guide to assessing the impact of imputation tax credits on returns.

4. The Relation Between Returns and Credit Yields

The AER emphasises that it is important to recognise that the evidence from drop-off studies is that the market views a one-dollar dividend as worth less than one dollar. When this evidence is taken into account, one finds that franking credits have positive value. For example, the AER states that:[70]

> Handley provides a critique of SFG's assertion that theta should be set close to zero. If credits indeed have negligible value (consistent with a fully integrated capital market), we would expect to observe a similar drop-off in Australia as is observed in international markets. However the evidence from overseas (e.g. the US market, with no imputation system) is that a $1.00 cash dividend is less than fully valued. Therefore the consistent result from Australian dividend drop-off studies that a $1.00 fully franked dividend is valued at close to $1.00 clearly suggests that franking credits have a positive value.

In other words, the AER uses evidence from drop-off studies that the market values a one-dollar dividend at less than a dollar to justify a positive value for gamma. However, if the market value of a one-dollar dividend is less than one dollar, then the return to a stock that pays dividends should be adjusted upwards to reflect that penalty. Notwithstanding, on Handley's advice, the AER makes no such adjustment. Handley says that:[71]

> . …at this stage there is insufficient evidence to justify replacing the standard CAPM with the Brennan CAPM, as although differential personal taxes clearly [a]ffect pricing around ex-dividend dates, "a growing body of evidence shows that within static, single period equilibrium models, there is no convincing evidence of a significant cross-sectional relation between stocks' returns and their dividend yields".

The passage above, that Handley cites, comes from a review paper written by Allen and Michaely (2003).[72] One of the studies to which Allen and Michaely refer is a paper by Fama and French (1993) that tests whether US portfolios sorted on the basis of past dividend yields earn abnormal returns relative to a three-factor model that they introduce.[73] This paper is one of many that have tested for a relation between yields and returns across stocks while controlling for risk. Fama and French conclude that there is no evidence that US yield-sorted portfolios earn abnormal returns. This is partly why Allen and Michaely state that there is no convincing evidence of a relation between returns and yields and why Handley recommends that no adjustment be made for the tax penalty that investors face on dividends.

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70 AER, Electricity transmission and distribution network service providers – Review of the weighted average cost of capital (WACC) parameters: Explanatory Statement, December 2008, page 321.

71 John C Handley, A Note on the Valuation of Imputation Credits: Report for the Australian Energy Regulator, 12 November 2008, page 16.

72 Allen, F. And R. Michaely, Payout Policy, in Handbook of the Economics of Finance, G.M. Constantinides, M. Harris and R.Stulz (eds), 2003, Elsevier B.V.

73 Fama, E. And K. French, Common Risk Factors in the Returns on Stocks and Bonds, Journal of Financial Economics 33, 3-56.

Tests like those that Fama and French conduct can also be used to test for a relation between returns and difference between franked and unfranked yields (ie, credit yields).[74] The AER's position is that there is no evidence of a relation between dividend yields and returns. This position is consistent with the use of Officer's (1994) model because in that model there is no tax penalty on dividends. Officer assumes that the rates of tax that a representative investor faces on capital gains and dividends are identical. On the other hand, the AER believes that the market value of imputation tax credits is positive. In particular, it believes that the market value of a one-dollar credit is 65 cents.

If the AER's reasoning is correct (which for the reasons explained here the AER is not), there should be a negative relation between credit yield and return after controlling for risk. In other words, if investors place a value on imputation credits they will be willing to accept a lower return for stocks that provide a high credit yield, because these stocks also provide investors with valuable imputation credits. Further, if the AER's position that there is no tax penalty on dividends is correct, there should be no need to control for dividend yield in testing for a negative relation.

Lajbcygier and Wheatley (2009) conduct tests for a negative relation between credit yield and return, controlling for risk. They conduct tests on Australian portfolios sorted by credit yield using the domestic CAPM, the Fama-French (1997) international two-factor model and a domestic version of the Fama-French two-factor model and find that there is no evidence of a negative relation between return and credit yield. In fact, they find evidence of a positive relation.

The two Fama-French international factors are the excess return to the world market portfolio and the difference between the returns to internationally diversified value and growth portfolios. The two Fama-French domestic factors are the excess return to the domestic market portfolio and the difference between the returns to diversified domestic value and growth portfolios. Like Fama and French (1997), when using the international two-factor model, Lajbcygier and Wheatley measure returns in USD and compute excess returns to the yield portfolios using the US one-month bill rate. Lajbcygier and Wheatley use monthly data from 1988 to 2007 from the Australian School of Business together with monthly data from Ken French's website. Their results are reproduced below. Alphas are the intercepts from regressions of excess returns to the credit-yield sorted portfolios on the two factors.

[74] The credit yield measures the difference between the yield of a stock including imputation credits and the yield of a stock excluding imputation credits. For example, if a stock has a franked yield of 5 percent and an unfranked yield of 3.5 percent, it will have a credit yield of 1.5 per cent.

Table 4.4.1
Credit Yields, Mean Returns and Abnormal Returns in Percent Per Annum

Credit yield quartile				
Low	2	3	High	High-Low
Credit yields				
0.2	0.6	1.9	2.9	2.7
Mean returns				
10.5	12.3	16.0	17.0	6.5
Alpha: Domestic CAPM				
-3.3	-2.5	1.3	3.1	6.4
Alpha: Domestic two-factor model				
-3.6	-2.2	1.8	2.0	5.6
Alpha: International two-factor model				
-1.5	-1.0	3.0	4.4	5.8

The results are based on monthly data from the Australian School of Business and monthly data from Ken French's web site from 1988 to 2007.

The AER's position is that a sensible estimate for theta is 0.65. With a value for theta of 0.65, one would expect the alpha of a zero-investment position that is long the high-credit-yield portfolio and short the low-credit-yield portfolio to be (ignoring differences between the risk of high and low yield portfolios) around $0.65 \times (0.2 - 2.9) = -1.75$ percent per annum.[75] Instead, the alphas associated with the zero-investment position are 6.4, 5.6 and 5.8 percent per annum for the domestic CAPM, the domestic two-factor model and the international two-factor model. These estimates are sufficiently large that the null hypothesis that there is a negative relation between returns and credit yields after controlling for risk can be rejected at the 1 percent level no matter which of the three pricing models is used. In other words, conditional on there being no tax penalty for dividends, the evidence indicates that there is *no support for using a positive value for gamma*.

[75] High credit yield stocks provide on average imputation credits of 2.9 percent of the stocks purchase price, while low credit yield stocks provide imputation credits of just 0.2 per cent. Therefore, if imputation credits were worth 65 per cent of their face value, then on would expect investors to reallocate their wealth across stocks until the returns to high credit yield stocks were 1.75 per cent (ie, 65% × (2.9 – 0.2)) lower than low credit yield stocks.

Appendix A. Theoretical Example

This appendix describes the example to which Chapter 3 refers that shows that foreign investors can have a significant impact on the value of imputation credits even when they hold no domestic shares. The model is a simple general equilibrium version of the single-period model Wood (1997) describes.[76]

In the model there is a single currency and two assets in positive net supply: one domestic risky asset and one foreign risky asset. The supplies of shares in the two assets are fixed, their payoffs one period from now are normally distributed, and a representative domestic investor and a representative foreign investor both display constant absolute risk aversion.

Let

$A_D(A_F)$	=	Absolute risk aversion of the domestic (foreign) investor
$F_D(F_F)$	=	Franking credits paid on each domestic share to the domestic (foreign) investor
$N_D(N_F)$	=	Supply of domestic (foreign) shares
$N_D^D\left(N_D^F\right)$	=	Number of domestic shares held by the domestic (foreign) investor
$N_F^D\left(N_F^F\right)$	=	Number of foreign shares held by the domestic (foreign) investor
$P_0^D\left(P_0^F\right)$	=	Price of a domestic (foreign) share today
$P_1^D\left(P_1^F\right)$	=	With-dividend but without-credit value of a domestic (foreign) share one period hence
$W_0^D\left(W_0^F\right)$	=	Domestic (foreign) wealth today
$W_1^D\left(W_1^F\right)$	=	Domestic (foreign) wealth one period hence

The model assumes that each investor chooses an investment plan to maximise

$$\mathrm{E}\left(-\mathrm{e}^{-A_j W_1^j}\right) = -\mathrm{e}^{-A_j \mathrm{E}\left(W_1^j\right) + 0.5 A_j^2 \mathrm{Var}\left(W_1^j\right)}, \qquad j = D,F \tag{1}$$

subject to the budget constraints

$$N_D^j P_0^D + N_F^j P_0^F = W_0^j, \qquad j = D,F, \tag{2}$$

[76] Wood J., A Simple Model for Pricing Imputation Tax Credits Under Australia's Dividend Imputation Tax System, Pacific-Basin Finance Journal 5, 1997, 465-480.

$$N_D^j P_1^D + N_F^j P_1^F = W_1^j, \qquad j = D,F, \tag{3}$$

where E(.) and Var(.) are the mean and variance operators, while equilibrium requires that the demand for domestic (foreign) shares matches the supply of domestic (foreign) shares, that is, equilibrium requires that

$$N_j^D + N_j^F = N_j, \qquad j = D,F. \tag{4}$$

We consider two scenarios. In each scenario

$$A_D W_0^D = A_F W_0^F = 1, \qquad N_D = W_0^D = 5, \qquad N_F = W_0^F = 100,$$

and

$$\begin{pmatrix} P_1^D \\ P_1^F \end{pmatrix} \sim N\left(\begin{pmatrix} 1.12 \\ 1.12 \end{pmatrix}, \begin{pmatrix} 0.06 & 0.04 \\ 0.04 & 0.04 \end{pmatrix} \right).$$

Thus we assume that the domestic country is much smaller than the foreign country, both in terms of its wealth and in terms of the number of shares outstanding on its asset. We assume that the relative risk aversion evaluated at initial wealth of both the domestic and foreign representative investors is one.

In the first scenario $F_D = F_F = 0,$ that is, no franking credits are issued. It is straightforward to show that under this scenario

$$N_D^D = 0.2381, \qquad N_D^F = 4.7619, \qquad N_F^D = 4.7619,$$

$$N_F^F = 95.2381, \qquad P_0^D = 0.9992, \qquad P_0^F = 1.0000.$$

So the required with-dividend returns to the domestic and foreign assets are

$$\mathrm{E}(R_D) = \frac{1.1200}{0.9992} - 1 = 0.1209,$$

$$\mathrm{E}(R_F) = \frac{1.1200}{1.0000} - 1 = 0.1200.$$

In equilibrium, domestic and foreign investors will hold identical portfolios but foreign investors will hold 20 times as many domestic and foreign shares because they are 20 times as wealthy as domestic investors.

In the second scenario $F_D = 0.02,$ while $F_F = 0,$ that is, franking credits are issued to the domestic investor but not to the foreign investor. Under this scenario, one can show that

$$N_D^D = 5, \qquad N_D^F = 0, \qquad N_F^D = 0,$$

$$N_F^F = 100, \qquad P_0^D = 1.0000, \qquad P_0^F = 1.0000.$$

So the required with-dividend returns to the domestic and foreign assets are

$$\mathrm{E}(R_D) = \frac{1.1200}{1.0000} - 1 = 0.1200,$$

$$\mathrm{E}(R_F) = \frac{1.1200}{1.0000} - 1 = 0.1200.$$

In equilibrium, domestic investors will hold only the domestic asset and foreign investors will hold only the foreign asset. Although the franking credit adds 2 percent to the with-dividend return that domestic investors earn on the domestic asset, the required with-dividend return to the domestic asset falls by only 0.09 percent. Thus, even though all franking credits are received and redeemed by domestic investors, they are valued at considerably less than their face value by the market.

Appendix B. Project Team

Gregory Houston (Director) has twenty years experience in the economic analysis of markets and the provision of expert advice in litigation, business strategy, and policy contexts. His career as a consulting economist was preceded by periods working in a financial institution and for government.

Greg Houston has directed a wide range of competition, regulatory economics and valuation-related assignments since joining NERA in 1989. His work in the Asia Pacific region principally revolves around the activities of the regulatory agencies responsible for these areas, many of whom also number amongst his clients. Greg has advised clients on merger clearance processes, competition enforcement proceedings involving allegations of predatory pricing, anti-competitive bundling and price fixing, a wide range of infrastructure access regulation matters, intellectual property valuation and a number of shareholder class action proceedings. His industry experience spans the aviation, beverages, building products, e-commerce, electricity and gas, grains, medical waste, mining, payments networks, petroleum, ports, rail transport, retailing, scrap metal, securities markets, steel and telecommunications sectors. Greg Houston has acted as expert witness in valuation, antitrust and regulatory proceedings before the courts, in various arbitration and mediation processes, and before regulatory and judicial bodies in Australia, Fiji, New Zealand, the Philippines, Singapore and the United Kingdom.

In December 2005, Greg was appointed by the Hon Ian Macfarlane, Minister for Industry, Tourism and Resources, to an Expert Panel to advise the Ministerial Council on Energy on achieving harmonisation of the approach to regulation of electricity and gas transmission and distribution infrastructure in Australia.

Greg also serves on the Trade Practices Committee of the Law Council of Australia, the United States Board of Directors and the Management Committee of National Economic Research Associates Inc, and is head of NERA's Australian operations.

Brendan Quach is a **Senior Consultant** in our Sydney office and has over eight years experience as an economist. He specialises in network economics and competition policy in Australia, New Zealand and the Asia Pacific region. Since joining NERA in 2001, Brendan has advised clients on the application of competition policy in Australia, in such industries as aviation, airports, electricity, rail and natural gas. Brendan specialises in regulatory and financial modelling and the cost of capital for network businesses.

Simon Wheatley was until recently a Professor of Finance at Melbourne University. From the beginning of 2008, Simon has worked full time outside the university sector. Simon's expertise is in the areas of testing of asset-pricing models, determining the extent to which returns are predictable and individual portfolio choice theory. Prior to joining the University of Melbourne, Simon taught at the Universities of British Columbia, Chicago, New South Wales, Rochester and Washington.

A complete curricula vitae for each member of the project team can be provided on request.

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