The consistency of estimates of the value of cash dividends

Report prepared for ENA, APIA, and Grid Australia

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PO Box 29, Stanley Street Plaza
South Bank QLD 4101
Telephone +61 7 3844 0684
Email s.gray@sfgconsulting.com.au
Internet www.sfgconsulting.com.au

STRATEGIC FINANCE GROUP
SFG CONSULTING

Level 1, South Bank House
Stanley Street Plaza
South Bank QLD 4101
AUSTRALIA

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Context, reason for report, and summary

Context

1. This report has been prepared by Professor Stephen Gray, Professor of Finance at the University of Queensland Business School and Managing Director of Strategic Finance Group (SFG Consulting), a corporate finance consultancy specialising in valuation, regulatory and litigation support advice.

2. I have previously prepared a report dated 16 September 2008 and titled *The effect of franking credits on the cost of capital of Australian firms* in relation to this decision-making process. Some elements of that report were considered by the AER in its *Review of WACC parameters: Explanatory statement* (the *Explanatory Statement*).[1] I have now been engaged by the ENA, APIA, and Grid Australia to provide a response to certain issues raised in the *Explanatory Statement*.

3. In this report I have been asked to examine the AER's response to the identification of an inconsistency in the value of cash dividends that is used in two steps of the WACC estimation process.

4. For the purposes of preparing this report I was provided with a copy of the Federal Court guidelines *Guidelines for Expert Witnesses in Proceedings in the Federal Court of Australia* dated 5 May 2008. I have reviewed those guidelines and this report has been prepared consistently with the form of expert evidence required by those guidelines. In preparing this report, I have made all the inquiries that I believe are desirable and appropriate and no matters of significance that I regard as relevant have, to my knowledge, been withheld.

The inconsistency

5. My earlier report points out that inconsistent estimates of the value of cash dividends are used in two places in the AER's reasoning:

   a. The AER's empirical estimates of theta (and consequently gamma) are conditional on an estimated value of cash dividends (75-80 cents per dollar); and

   b. The AER's estimate of the required return on equity using the CAPM is conditional on a particular value of cash dividends (100 cents per dollar).

AER accepts that the inconsistency exists

6. It is clear that both Handley (2008) and the AER accept that there is such an inconsistency:

> Handley agrees with SFG that the empirical evidence from dividend drop-off studies – that cash dividends are less than fully valued – presents an apparent inconsistency with the standard CAPM.[2]

[1] Australian Energy Regulator (2008), Electricity transmission and distribution network service providers -- Review of the weighted-average cost of capital (WACC) parameters: Explanatory statement, December.
[2] *Explanatory Statement*, p. 335.

AER allows the inconsistency to stand

7. The AER has decided that no steps should be taken to resolve the inconsistency. The AER's justification for this decision is based on additional pieces of empirical evidence about the value of cash dividends, as reported by its consultant Handley (2008) – dividend yield studies and US drop-off studies. In particular, Handley (2008) and the AER suggest that:

   a. Because the dividend yield studies support cash dividends being valued at 100 cents per dollar, there is some support for their continued use of the Sharpe CAPM which estimates the required return on equity conditional on cash dividends being fully valued; and

   b. Because their interpretation of the US drop-off studies is that cash dividends are valued at less than their face value, there is some support for their process of producing estimates of theta that are conditional on cash dividends being worth only 75-80 cents per dollar.

Summary of analysis and conclusions

8. My view is that the application of this additional evidence by Handley and the AER is illogical and wrong. In my view, it is neither logical nor correct to use inconsistent estimates of the same parameter (the value of cash dividends in this case) in two steps of the same WACC estimation exercise. Even if there are inconsistent estimates of the value of a parameter, the correct approach is to properly consider all of the available evidence, select a value for that parameter, and then to apply that same value of the parameter consistently throughout the steps involved in estimating the WACC.

9. In any event, I demonstrate in this report that the US drop-off evidence actually supports an estimate that cash dividends are valued at 100 cents in the dollar. That is, Handley (2008) and the *Explanatory Statement* both refer to dividend yield studies and US dividend drop-off studies. Both types of study support the view that cash dividends are fully valued and are consistent with the use of the CAPM to estimate required returns. Consistency then demands that theta also be estimated on the basis that cash dividends are fully valued.

10. My earlier report shows that if dividend drop-off analysis is used to estimate theta on the basis that cash dividends are fully valued, the resulting estimate of theta is immaterially different from zero. In this case, we would have an estimate of the required return on equity (from the CAPM) that is conditional on cash dividends being fully valued and an estimate of theta conditional on cash dividends being fully valued – the same value of cash dividends is used in both steps and the result is a theta estimate immaterially different from zero.

11. My earlier report also noted that this outcome – use of the CAPM to estimate required returns and setting theta (and consequently gamma) to zero – is the standard practice of Australian companies and expert valuation professionals.

Professor Stephen Gray
1 February 2009

Summary of the inconsistency

12. My earlier report points out that inconsistent estimates of the value of cash dividends are used in two places in the AER's reasoning:

    a. The AER's empirical estimates of theta (and consequently gamma) are conditional on an estimated value of cash dividends (75-80 cents per dollar); and

    b. The AER's estimate of the required return on equity using the CAPM is conditional on a particular value of cash dividends (100 cents per dollar).

13. I concluded in my earlier report that it is wrong to use two different estimates of the same parameter in two steps of the process used to estimate WACC. I proposed that the inconsistency should be reconciled by:

    a. Continuing to use the CAPM to estimate the required return on equity conditional on cash dividends being valued at 100 cents per dollar; and

    b. Estimating theta also conditional on cash dividends being valued at 100 cents per dollar – rather than adopting a different estimate of the value of cash dividends when estimating theta.

14. My earlier report shows that if dividend drop-off analysis is used to estimate theta on the basis that cash dividends are fully valued, the resulting estimate of theta is immaterially different from zero. In this case, we would have an estimate of the required return on equity (from the CAPM) that is conditional on cash dividends being fully valued and an estimate of theta conditional on cash dividends being fully valued – the same value of cash dividends is used in both steps and the result is a theta estimate immaterially different from zero.

15. My earlier report also noted that this outcome – use of the CAPM to estimate required returns and setting theta (and consequently gamma) to zero – is the standard practice of Australian companies and expert valuation professionals.

Does gamma affect company values?

16. The first point made in the Explanatory Statement in relation to the inconsistency between the two estimates of the value of cash dividends is as follows:

> Handley demonstrates that the inclusion of imputation credits in the analysis will not affect company values as long as they are consistently recognised in the cash flows as well as the discount rate.[3]

17. This is not true. In my view, this paragraph fundamentally misconstrues a key issue in relation to dividend imputation.

18. Handley (2008) summarises the key results of Officer (2004) in showing that there are several different ways of defining the cash flows and each one has a specific definition of the discount rate that must be applied to it. That is, there must be a consistency between the definitions of the cash flows and the discount rate. Officer shows that the various different definitions produce the same company value so long as (a) the cash flows and discount rate are defined consistently; and (b) the same value of gamma is used in all cases. Handley reiterates this result. I agree with all of this and do not consider any of it to be controversial.

19. However, it plainly does *not* follow from this that "the inclusion of imputation credits in the analysis will not affect company values as long as they are consistently recognised in the cash flows as well as the discount rate." If we set gamma to 0, the different approaches all produce the same company value as each other. If we set gamma to 0.65, the different approaches all produce the same company value as each other – but it is a different company value from the case where gamma is set to 0.

20. In summary, the Explanatory Statement's leading point in responding to the inconsistency identified in the JIA submissions is plainly wrong. Changing the estimate of gamma *does* affect company values. The value of the company is increased by the present value of the expected future franking credits.

[3] *Explanatory Statement*, p. 335.

AER's acceptance of the inconsistency

21. Inconsistent estimates of the value of cash dividends are used in two places in the AER's reasoning:

    a. The AER's empirical estimates of theta (and consequently gamma) are conditional on an estimated value of cash dividends (75-80 cents per dollar); and

    b. The AER's estimate of the required return on equity using the CAPM is conditional on a particular value of cash dividends (100 cents per dollar).

22. It is clear that both Handley (2008) and the AER accept that there is an inconsistency:

> Handley agrees with SFG that the empirical evidence from dividend drop-off studies – that cash dividends are less than fully valued – presents an apparent inconsistency with the standard CAPM.[4]

23. Logically, three different approaches can be taken in relation to the inconsistency between (a) and (b) above that has been identified and accepted:

    a. Adjust the estimate of the value of cash dividends in (a) above so that it is consistent with that in (b);

    b. Adjust the estimate of the value of cash dividends in (b) above so that it is consistent with that in (a); or

    c. Make no change to either estimate and continue to use inconsistent estimates for the same parameter in the two steps of the AER's reasoning process.

24. The AER has adopted the last of these options. An inconsistency has been identified between the value used for the same parameter (the value of cash dividends) in two steps of the AER's reasoning process. The AER has accepted that the inconsistency exists. The AER has decided that no steps should be taken to resolve the inconsistency.

[4] *Explanatory Statement*, p. 335.

AER's reasons for maintaining the inconsistency

25. There is an inconsistency between the estimate of the value of cash dividends used in two places in the AER's reasoning:

    a. The AER's empirical estimates of theta (and consequently gamma) are conditional on an estimated value of cash dividends (75-80 cents per dollar); and

    b. The AER's estimate of the required return on equity using the CAPM is conditional on a particular value of cash dividends (100 cents per dollar).

26. The AER accepts that the inconsistency exists, but has decided that no steps should be taken to resolve it.

27. The AER's justification for this decision is based on additional pieces of empirical evidence about the value of cash dividends, as reported by its consultant Handley (2008). That is, the inconsistency involves different estimates of the value of cash dividends being used in two steps of the AER's reasoning process. The AER, through its consultant, has consequently examined other pieces of empirical evidence pertaining to the value of cash dividends.

28. The AER (via Handley, 2008) considers two strands of empirical research:

    a. Dividend yield studies: These studies compare the average returns of high- and low-yield companies. The basis of these studies is that if dividends really are valued at less than their face value, companies with high dividend yields would have to offer higher returns, other things equal, to attract equity capital. That is, because dividends are disfavoured by investors, high-yield companies would have to offer higher returns on average.

    b. US dividend drop-off studies: These studies apply dividend drop-off analysis to US stocks. The US operates a classical tax system, so there are no franking credits to complicate the analysis. Consequently, the average change in the stock price around the ex-dividend is interpreted as an estimate of the market value of cash dividends.

29. Handley (2008) and the AER conclude that:

    a. The dividend yield studies support cash dividends being valued at 100 cents per dollar; but that

    b. The US drop-off studies support cash dividends being valued at less than 100 cents per dollar.[5]

30. Handley (2008) and the AER then suggest that:

    a. Because the dividend yield studies support cash dividends being valued at 100 cents per dollar, there is some support for their continued use of the Sharpe CAPM which estimates the required return on equity conditional on cash dividends being fully valued; and

[5] In the subsequent section, I discuss these pieces of evidence and the way they are interpreted by Handley and the AER and I identify some important errors and omissions that have been made. However, the remainder of this section proceeds on the basis that Handley's characterisation of these empirical studies is both complete and correct.

b. Because their interpretation of the US drop-off studies is that cash dividends are valued at less than their face value, there is some support for their process of producing estimates of theta that are conditional on cash dividends being worth only 75-80 cents per dollar.

31. That is, Handley and the AER have examined two additional pieces of evidence in relation to the value of cash dividends. Their interpretation of this evidence is that the two pieces of evidence produce inconsistent estimates of the value of cash dividends. They then use one piece of evidence to support the value of cash dividends that they assume when estimating the required return on equity (100 cents per dollar) and the other piece of evidence to support the value of cash dividends they assume when estimating theta (75-80 cents per dollar). They conclude from this that it is appropriate to maintain their inconsistent estimates of the value of cash dividends in the two steps of their reasoning process.

32. My view is that the application of this additional evidence by Handley and the AER is illogical and wrong. In my view, it is neither logical nor correct to use inconsistent estimates of the same parameter (the value of cash dividends in this case) in two steps of the same WACC estimation exercise. Even if there are inconsistent estimates of the value of a parameter, the correct approach is to properly consider all of the available evidence, select a value for that parameter, and then to apply that same value of the parameter consistently throughout the steps involved in estimating the WACC.

33. For example, there are a number of estimates of the optimal leverage for the benchmark firm. The correct approach is to consider all of the available information and to select a single value that is used consistently in all steps of the WACC estimation. It would not be appropriate to use one piece of evidence to justify a particular leverage estimate to be used to take the weighted average of the estimated costs of debt and equity, but then to use a different piece of evidence to justify a different leverage estimate to be used when re-levering beta estimates.

34. In summary, the AER uses inconsistent estimates of the value of cash dividends in two steps of the WACC estimation process. It estimates the required return on equity conditional on cash dividends being worth 100 cents per dollar, and it estimates theta (and consequently gamma) conditional on cash dividends being worth 75-80 cents per dollar. The AER recognises this inconsistency, but has decided to allow the inconsistency to remain. The basis for this decision is that the two inconsistent estimates are each supported by a piece of empirical evidence. Even if this were true, the appropriate approach is to properly consider all of the available evidence, select a value for the parameter, and then to apply that same value of the parameter consistently throughout the steps involved in estimating the WACC.

Dividend yield studies

35. As I have set out above, the dividend yield studies considered by Handley (2008) compare the average returns of high- and low-yield companies. The basis of these studies is that if dividends really are valued at less than their face value, companies with high dividend yields would have to offer higher returns, other things equal, to attract equity capital. That is, because dividends are disfavoured by investors, high-yield companies would have to offer higher returns on average.[6]

36. It is generally accepted that these studies find that there is no difference at all between the average returns of high- and low-yield companies. This suggests that investors do not differentiate between firms that provide them with returns via dividends and firms that provide returns via capital gains. Other things equal, firms require exactly the same return whether it is provided as a dividend or as a capital gain. In other words, dividends are valued at 100 cents per dollar. Handley (2008) cites a recent paper by Graham, Michaely and Roberts (2003) which concludes that:

> 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.[7]

37. The implication of this evidence is that cash dividends are valued at 100 cents per dollar. This is consistent with the CAPM, which estimates the required return on equity conditional on cash dividends being valued at 100 cents in the dollar. That is, this evidence provides no reason to use a model other than the Sharpe CAPM to estimate required returns.

38. I note that this is consistent with the dominant market practice, which is to not use a more complex model that allows for investors to value dividends at less than their face value. The evidence from this line of research indicates that the more complex models are unnecessary.

39. In summary, the dividend yield studies support the view that cash dividends are valued at 100 cents per dollar, which is consistent with the use of the CAPM to estimate the required return on equity conditional on cash dividends being fully valued.

[6] Of course, controls must be put in place to take account of other systematic differences between high- and low-yield stocks and this is generally done quite carefully, especially by more recent studies.
[7] Handley (2008, p. 16).

US dividend drop-off studies

Interpretation of Handley (2008) relied on by the AER

40. As I have set out above, US dividend drop-off studies apply dividend drop-off analysis to US stocks. Since the US operates a classical tax system, there are no franking credits to complicate the analysis. Consequently, the average change in the stock price around the ex-dividend is interpreted as an estimate of the market value of cash dividends.

41. The US dividend drop-off literature is large with many papers having been written in the area. Handley (2008) interprets this literature as providing evidence that in the US market cash dividends are valued at less than 100 cents per dollar. In particular, he cites Graham, Michaely and Roberts (2003) in concluding that:

> in most periods examined, the average price drop is less than the dividend paid.[8]

Boyd and Jagannathan (1994)

42. I note, however, that Handley (2008) does not cite the leading paper in this literature Boyd and Jagannathan (1994) who conclude that:

> over the last several decades, one-for-one marginal price drop has been an excellent (average) rule of thumb.[9]

43. Boyd and Jagannathan (1994) use a more robust econometric methodology that allows for non-linearities and other statistical problems that may cause estimation errors. They also use a very large sample of more than 132,000 ex-dividend events. That is, they have been very careful to provide the most robust and reliable results possible. In this regard, they note that there is:

> a significant problem confronting researchers in this area – an extremely high noise-to-signal ratio. Dividend yields vary across stocks and across time, but their variability is miniscule compared to that of daily stock returns…To illustrate these issues we estimate price drop equations annually for each of the 25 years in our sample. Simply put, the results vary enormously from year to year. The implication is that inferences based on one or a few years' data will be extremely imprecise. One solution is to examine a very long time period as is done in this study.[10]

44. That is, Boyd and Jagannathan (1994) conclude that with dividend drop-off studies it is important to apply robust econometrics to a very large data set accumulated over a long period of time. I note that this advice has not been heeded by Beggs and Skeels (2006) who report separate estimates for various small sub-sets of data. Not only does the Australian market have many fewer stocks than the US, but Beggs and Skeels use a series of short data periods in their analysis. Consequently, it is not surprising that Beggs and Skeels report coefficients that vary considerably from period to period and that some of their estimates are simply implausible.[11]

[8] Handley (2008, p. 10).
[9] Boyd and Jagannathan (1994, p. 711).
[10] Boyd and Jagannathan (1994, p. 715-716).
[11] For example, for one of their sub-samples, Beggs and Skeels (2006) report that a one dollar cash dividend is valued at $1.18.

45. Boyd and Jagannathan (1994) finally conclude that:

> In reviewing all the empirical results, we note that marginal ex-dividend price drop is almost always one-for-one with dividends (in the cross-section). This result is obtained with a variety of different specifications and over a period of approximately 25 years.[12]

46. That is, the conclusion from the authors of this important paper in one of the leading journals is that drop-off analysis, when properly executed (in terms the econometric specification and the sample size) leads to the conclusion that cash dividends are fully valued. In a setting in which there are no franking credits, a one dollar cash dividend results in a drop-off of one dollar.

Graham, Michaely and Roberts (2003)

47. In concluding that US drop-off analyses support the conclusion that cash dividends are less than fully valued, Handley (2008) cites the work of Graham, Michaely and Roberts (2003) who examine dividend drop-offs over three sub-periods. US stocks traded in increments of an eighth of a dollar during the first period, sixteenths of a dollar during the second, and in increments of a cent during the third. The authors also examine drop-off ratios for companies grouped by dividend yield.

48. Table V of Graham, Michaely and Roberts (2003) reports the drop-off ratios for higher dividend yields stocks as follows:

Excerpt from Table V of Graham, Michaely and Roberts (2003)

Dividend Yield	Statistic	Sub-period 1 (eighths)	Sub-period 2 (sixteenths)	Sub-period 3 (decimal)
>2%	Mean	0.9984	1.0016	1.0218
>2%	Median	0.9868	0.9838	0.9565

Source: Graham, Michaely and Roberts (2003) Table V p. 2627.

49. This table indicates that for dividends that represent a yield of 2% or more the drop-off is essentially one-for-one. Indeed Graham, Michaely and Roberts (2003) demonstrate that all of the drop-offs in the table above are insignificantly different from 1.0. That is, Graham, Michaely and Roberts (2003) establish that dividends that represent a yield of 2% or more are valued by the market at 100 cents per dollar.

50. In my view, it is appropriate to focus on the higher-yield observations because the annual dividend yield on the firms in the ASX 200 index is in the order of 5%.[13] Since Australian firms pay dividends twice per year, the yield for each dividend event is, on average, 2.5%. Consequently, the "greater than 2% yield" category is the most appropriate for the average Australian company.

51. In this regard, I also note that the AER's conclusions in relation to gamma are based on an assumption that Australian firms routinely and immediately pay out all of their earnings as dividends. In particular, the AER sets the franking credit distribution rate (F) equal to 1.0 on the

[12] Boyd and Jagannathan (1994, p. 716).
[13] Of course, the exact value varies over time as stock prices change – but historically has averaged around 5%.

basis that all of the free cash flow of every firm is immediately paid out as a dividend. If all firms immediately paid out all of their free cash flow as dividends (as Handley and the AER assume), dividend yields would be even higher than they actually are in reality. Consequently, consistency with the process the AER uses to estimate the franking credit distribution rate (F) requires a focus on dividend drop-off results for high-yield observations.

52. In relation to the AER's assumption about dividend payouts in (b) above, the *Explanatory Statement* states that:

> Handley states that for valuation purposes the payout ratio should be set to one, consistent with an assumption of full distribution of free cash flows.[14]

53. The *Explanatory Statement* goes on to note that the AER's setting of the franking credit distribution rate (F) to 1.0 is based on an:

> assumption for valuation purposes is that a firm will distribute 100 per cent of its free cash flows, and therefore for consistency a 100 per cent payout of imputation credits is appropriate.[15]

54. In my view the assumption that all free cash flow is immediately paid out as a dividend is unnecessary and inconsistent with both the Officer CAPM-WACC framework and with market practice. However, given that the AER has relied on this assumption, the relevant result from Graham, Michaely and Roberts (2003) is that relating to higher yield observations.

55. As I explain in Paragraph 50 above, the higher yield observations provide the only relevant result even if the assumption of 100% payout were not adopted. That is, I can see no basis at all for relying on any result from Graham, Michaely and Roberts (2003) other than that relating to higher-yield observations.

Conclusions in relation to US drop-off studies

56. In my view, the US drop-off literature supports the conclusion that the most appropriate estimate for the value of cash dividends is 100 cents per dollar. This conclusion is based on the analysis set out above:

a. Boyd and Jagannathan (1994) conclude that dividend drop-off analysis, when properly executed (in terms the econometric specification and the sample size) leads to the conclusion that cash dividends are fully valued. In a setting in which there are no franking credits, a one dollar cash dividend results in a drop-off of one dollar.

b. Graham, Michaely and Roberts (2003) also show that cash dividends are fully valued so that a one dollar cash dividend results in a drop-off of one dollar in cases where the dividend represents a yield of 2% or more. It is appropriate to focus on this result as:

   i. The average actual dividend observation in Australia is greater than 2%; and

[14] *Explanatory Statement*, p.296.
[15] *Explanatory Statement*, p.297.

ii. The AER sets the franking credit distribution rate (F) to 1.0 on the basis that all free cash flows are immediately paid out as dividends and this would be consistent with even higher dividend yields.

Even if the AER's interpretation of US drop-off studies is adopted, the inconsistency remains

57. As set out above, the leading paper in the area (Boyd and Jagannathan, 1994) and the relevant results from Graham, Michaely and Roberts (2003) support the notion that cash dividends are fully valued by the market. In this section, I consider the consequences if, in contrast to my conclusions and the published results that are set out above, the AER's interpretation of US drop-off studies is adopted and dividends are considered to be valued at less than their face value.

58. Even if the AER view about cash dividends being valued by the market at less than their face value were adopted, there still remains an inconsistency between:

a. The AER's empirical estimates of theta (and consequently gamma), which are conditional on an estimated value of cash dividends of 75-80 cents per dollar; and

b. The AER's estimate of the required return on equity using the CAPM, which is conditional on cash dividends being valued at 100 cents per dollar.

59. For the reasons set out above, it is my view that the same value of a parameter should be used consistently throughout the steps involved in estimating the WACC. Regardless of how the AER might interpret the results of US drop-off studies, their proposed approach uses two different estimates of the value of cash dividends in two steps of the WACC estimation.

Australian dividend drop-off studies

60. My earlier report also noted that Australian dividend drop-off studies consistently conclude that a one dollar cash dividend plus the associated franking credit are value at a total of one dollar. Handley (2008) agrees with this assessment of the relevant studies:

> the empirical evidence indicates that the drop off associated with the payment of a $1 fully franked dividend is approximately $1.00, as claimed.[16]

61. In my earlier report I discuss how various statistical problems make it difficult to separate the combined value of one dollar for the dividend plus franking credit into the component pieces. I conclude that:

> even though the combined value of the dividend plus franking credit can be reliably estimated, disaggregating this combined value into the separate contributions from the dividend and franking credit can be difficult.[17]

62. I then examine the results reported by Beggs and Skeels (2006). I note that they consistently estimate a combined value of one dollar, but that their separate estimates of the values of the cash dividend and franking credit vary dramatically:

> the estimated value of a $1.00 cash dividend starts at 50 cents, then increases to 80-85 cents, spiking at $1.16 for a short period, before returning to the 80-85 cents range. The estimated value of franking credits simply offsets the variation in these estimated values of cash dividends.
>
> There are two possible explanations for these results:
>
> (a) The true value of dividends and franking credits actually does vary substantially over time, with increases in the value of cash dividends being offset by decreases in the value of franking credits, and vice versa, such that the combined value of both remains relatively stable; or
>
> (b) Whereas the combined value of dividends plus franking credits can be more reliably estimated, statistical issues or estimation error makes it difficult to reliably disaggregate this combined value between its component parts.[18]

63. As set out in Handley (2008), I conclude that:

> estimates of the combined value of the dividend and franking credit are more reliable than separate estimates of the components.[19]

[16] Handley (2008, p. 12).
[17] Gray (2008, p.37).
[18] Gray (2008, p. 38).
[19] Handley (2008, p.

64. Consequently, the estimate that a one dollar dividend plus the attached franking credit is valued at one dollar is more robust and reliable and certainly more consistent across time. The individual estimates of the value of cash dividends and the value of franking credits are less reliable and vary more substantially over time.

65. In this regard, I note the conclusion of Boyd and Jagannathan (1994) above:

> a significant problem confronting researchers in this area – an extremely high noise-to-signal ratio. Dividend yields vary across stocks and across time, but their variability is miniscule compared to that of daily stock returns…To illustrate these issues we estimate price drop equations annually for each of the 25 years in our sample. Simply put, the results vary enormously from year to year. The implication is that inferences based on one or a few years' data will be extremely imprecise. One solution is to examine a very long time period as is done in this study.[20]

66. The Beggs and Skeels (2006) results, on which the AER primarily relies, use a sub-sample of Australian firms examined over a series of short sub-periods. In my view, this is likely to produce variable and unreliable estimates of the separate values of cash dividends and franking credits. Consequently, one should examine a larger data set over a longer period of time to increase reliability. One might also look to other evidence of the value of cash dividends. As set out above, this other evidence supports the notion that cash dividends are fully valued.

67. In summary, although it is clear that empirical estimates of theta (such as those presented by Beggs and Skeels, 2006) are conditional on cash dividends being valued at 75-80 cents per dollar. However, it is not clear that this estimate of the value of cash dividends is robust or reliable. It is affected by statistical problems set out in my earlier report, it is inconsistent with other relevant evidence, and it is inconsistent with the basis of the CAPM.

[20] Boyd and Jagannathan (1994, p. 715-716).

Reconciling the inconsistency

68. My earlier report points out that inconsistent estimates of the value of cash dividends are used in two places in the AER's reasoning:

    a. The AER's empirical estimates of theta (and consequently gamma) are conditional on an estimated value of cash dividends (75-80 cents per dollar); and

    b. The AER's estimate of the required return on equity using the CAPM is conditional on a particular value of cash dividends (100 cents per dollar).

69. I concluded in my earlier report that it is wrong to use two different estimates of the same parameter in two steps of the process used to estimate WACC. I proposed that the inconsistency should be reconciled by:

    a. Continuing to use the CAPM to estimate the required return on equity conditional on cash dividends being valued at 100 cents per dollar; and

    b. Estimating theta also conditional on cash dividends being valued at 100 cents per dollar – rather than adopting a different estimate of the value of cash dividends when estimating theta.

70. It is my view that the analysis set out above further confirms this conclusion. Handley (2008) and the *Explanatory Statement* both refer to dividend yield studies and US dividend drop-off studies. Both types of study support the view that cash dividends are fully valued and are consistent with the use of the CAPM to estimate required returns. Consistency then demands that theta also be estimated on the basis that cash dividends are fully valued.[21]

71. My earlier report shows that if dividend drop-off analysis is used to estimate theta on the basis that cash dividends are fully valued, the resulting estimate of theta is immaterially different from zero. In this case, we would have an estimate of the required return on equity (from the CAPM) that is conditional on cash dividends being fully valued and an estimate of theta conditional on cash dividends being fully valued – the same value of cash dividends is used in both steps and the result is a theta estimate immaterially different from zero.

72. My earlier report also noted that this outcome – use of the CAPM to estimate required returns and setting theta (and consequently gamma) to zero – is the standard practice of Australian companies and expert valuation professionals.

[21] Moreover, even if there were inconsistent estimates of the value of a parameter, the correct approach is to properly consider all of the available evidence, select a value for that parameter, and then to apply that same value of the parameter consistently throughout the steps involved in estimating the WACC.

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