

# **A Note on the Costs of Equity Financing**

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# 1. Introduction and Summary

1. The purpose of this paper is to provide an independent analysis of the costs of three forms of equity financing: A seasoned equity offering (SEO); a rights issue; and retained earnings. To achieve this, the paper is organized into the following sections. Section 2 considers the costs associated with SEOs. Section 3 considers the costs associated with rights issues. Section 4 considers the costs associated with the retention of earnings. Section 5 concludes by discussing the paper's implications for the AER's draft decision for *TransGrid* on the costs of issuing equity.
2. In summary:
  - The total cost of an underwritten public issue of new equity is equal to the underwriting fee less the value of the option to place shares with the underwriter plus the value of the option to acquire shares provided to outside investors.
  - The underwriting fee is the direct cost of an underwritten public issue. The indirect cost of an underwritten public issue is the net value of the underwriter's option to acquire underpriced shares less the firm's option to place overpriced shares. The total cost of an SEO is the sum of the direct and indirect costs.
  - The net value of the options to acquire and to place shares is equal to the difference between the equilibrium value of the shares sold and their issue price. In practice, this average difference is positive and is referred to as the average underpricing.
  - It is well agreed within the academic finance profession that the average total cost of an underwritten public issue should be estimated by summing the average underwriting fee (the direct cost) and the average underpricing (the indirect cost).
  - The total cost of a rights issue is equal to the underwriting fee less the value of the option to place shares with the underwriter plus the costs incurred by the current shareholders in facilitating the distribution of the newly issued shares.
  - It is well agreed within the academic finance profession that where companies' choices reveal a preference for financing through SEOs rather than rights issues, the total cost of a rights issue is at least as great as the total cost of an SEO.
  - It is well documented in the finance literature that in Australia the majority of share issues following a company's initial public offering and the majority of the funds so raised take the form of an SEO rather than a rights issue.
  - It is well documented in the finance literature that almost all rights issues occurring in Australia are a reflection of an ASX listing requirement and that voluntary rights issues almost never occur in Australia.
  - It is well documented in the finance literature that it is not costless to cut dividends in order to fund capex.
  - It is well documented in the finance literature that pecking order theory can not be taken as a complete descriptor of corporate financing decisions.

## 2. Costs associated with an SEO

3. A typical SEO underwriting agreement is described as follows: An underwriter is paid a fee and agrees to acquire  $m$  newly issued shares at a fixed price of  $X$  per share from a firm that already has  $n$  shares outstanding. If the underwriter can identify sufficient buyers who value the shares above  $X$  the shares can be placed and  $X$  per share paid on to the firm. If though there are insufficient buyers at a price of  $X$  the underwriter must still pay  $X$  to the firm and the underwriter will initially acquire the shares. The underwriter will subsequently distribute the shares at the price the market will bear.
4. The underwriter is obligated to pay a subscription price of  $X$  per share for each of  $m$  shares; i.e., the underwriter is long in a forward contract for the delivery of shares. The firm has the opposite side of the transaction: The firm is obligated to deliver  $m$  shares in return for  $X$  per share; i.e., the firm is short the forward contract. Equivalently the original shareholders of the firm must give up a fractional claim on the firm to the new shareholders in return for the receipt of  $m \times X$ . That fraction is simply  $\frac{m}{n+m}$ .

5. Let  $S$  denote the equilibrium value of each of the newly issued shares. It is instructive to express the cost to the original shareholders associated with reducing their fractional ownership of the firm in return for the capital infusion as
$$m(S - X) = m(\max[0, S - X] - \max[0, X - S]).$$

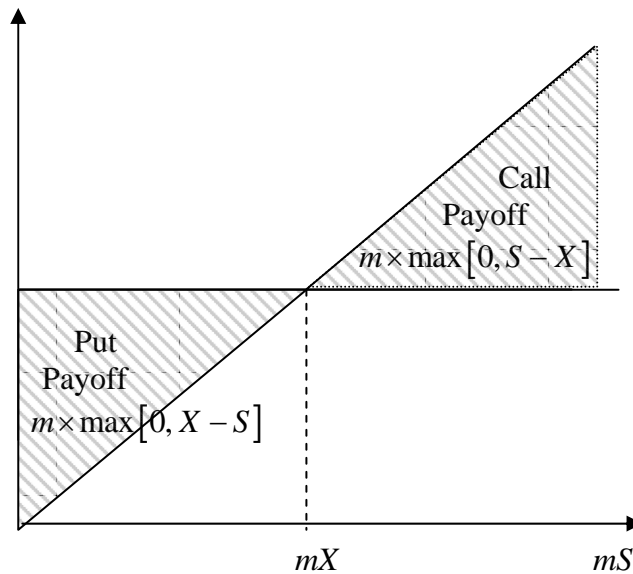
The original shareholders must bear this cost and pay the underwriting fee.

6. The first of the two  $\max[0, g]$  terms,  $\max[0, S - X]$ , is the payoff to the underwriter's *call* option to call shares away from the firm in the event their value turns out to be more than the subscription price.<sup>1</sup> The shares are called from the firm when there is underpricing. The  $\max[0, X - S]$  term gives the payoff to the original shareholders'/firm's *put* option to put shares to the underwriter in the event their value turns out to be less than the subscription price. The shares are put to the underwriter when there is overpricing.
7. Thus the cost to the original shareholders can be expressed as the underwriting fee (the direct cost) plus the net value of the options provided/received by the firm via the underwriting agreement (the indirect cost). The indirect cost is the value of the call option that the firm provides to the underwriter less the value of the put option the underwriter provides to the firm.

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<sup>1</sup> Some commentators have claimed that the underwriter's opportunity to allocate underpriced shares to favoured clients in return for future business with that client means that the issuing firm has "left money on the table", money that has been grasped by the underwriter. What is typically overlooked is that the money would have still been left had the underwriter simply allocated the underpriced shares randomly without any anticipation of future business with the lucky recipients. More importantly, the underwriter's opportunity to profit from underpricing by allocating the shares to favoured clients means that competition among would-be underwriters will lead to underwriting fees that are less than the sum of the underwriter's marketing and distribution costs plus the put option (insurance) provided by the underwriter. If the allocation of underpriced shares to favoured clients were to be outlawed, the effect in a competitive setting would simply be to increase the underwriting fee (the direct cost) without any reduction in the indirect cost associated with the on average underpricing.

8. The split of the indirect cost term into a call payoff less a put payoff may seem artificial, but is common in the finance literature and aids in comparing SEOs to rights issues. The split is a variant of the put-call parity relation familiar to finance practitioners and academics.



The put-call parity relation states that at the end of the subscription period

$$mS - mX = c - p$$

where  $c$  and  $p$  denote the respective values of a call and a put option written on  $m$  shares with a total exercise price of  $mX$ . At its heart, the indirect cost is simply the difference between the equilibrium price of the newly issued shares,  $mS$ , and the total subscription price,  $mX$ .

9. In the presence of underpricing, the net value of the two options is positive and equal to the level of underpricing. When the shares are worth more than the subscription price  $c$  exceeds  $p$ ; i.e., the underwriter's call is more valuable than the firm's put. In the presence of overpricing, the net value of the options is negative and equal to the level of overpricing. When the shares are worth less than the subscription price  $p$  exceeds  $c$ ; i.e., the underwriter's call is less valuable than the firm's put. It is an empirical regularity that underwritten public issues of new equity are on average underpriced.
10. For US companies, Chemmanur, He and Hu (2007) report average underpricing costs of 3.50%; Saunders, Palia, and Kim (2003) report average underpricing costs of 2.63%; Altinkilic and Hansen (2003) report average underpricing costs of 3.2%; and Chen and Wu (2002) report underpricing costs of 6.26%. The simple average of the four estimates of average underpricing is 3.9%.
11. The academic finance literature has long recognized that the total cost of an SEO is the sum of the direct (underwriting) cost and the indirect (underpricing) cost and that the direct underwriting cost understates the total cost of an SEO. The empirical evidence provided in section 3.4 of the CEG report titled *Nominal risk free rate, debt risk premium and debt and equity raising costs for Integral Energy* and dated April 2008 (co-authored by Tom Hird and myself) shows clearly that

the lowest estimate yet published in an academic finance journal of the average cost of raising new equity via underwritten public issues is 7.64%.

12. Lee, Lochhead, Ritter and Zhao (1996) estimate direct SEO costs for utilities at 4.9% but do not report average underpricing for this set of firms.<sup>2</sup> Adding the lowest available estimate for the average underpricing in an SEO of 2.63% (the Altinkilic and Hansen (2003) estimate) to the direct cost gives a total of 7.53%. This is a conservative estimate of the total cost of an SEO undertaken by a utility whose leverage makes its equity just as risky as the equity of the average firm.
13. Since the costs of due diligence by the underwriter and by potential buyers are higher when risk increases, the total cost of an SEO is higher for firms with lower credit ratings. There is no theoretical basis or published empirical evidence in the finance literature that would support a belief that a 60% geared BBB+ rated utility (a rating close to the cusp of investment grade) would have a lower cost than the average firm.

### **3. Costs associated with a rights issue**

14. When new shares are sold via an underwritten rights issue any valuable right to acquire new share at less than their equilibrium value is a right that is both provided by and enjoyed by the original shareholders. Thus the net value of the options provided/received by the original shareholders via the underwriting agreement (the indirect cost) is simply the value of the put option that is received by the firm from the underwriter. The *apparent* cost of a rights issue is then the underwriting fee less the value of the put acquired from the underwriter.
15. This is only the *apparent* cost since a new indirect cost appears when shares are distributed via a rights issue. With an underwritten public issue the underwriter bears the cost of distributing the shares (and receives compensation in the form of fees or a call option received from the issuing firm). With a rights issue the original shareholders themselves bear much of the marketing and distribution cost. The original shareholders avoid bearing this cost only when the issue turns out to be overpriced and the firm then exercises its option to put the overpriced shares to the underwriter. The underwriter suffers the loss associated with overpaying for the shares and must then bear the distribution costs of identifying the set of potential final buyers.
16. A sufficiently underpriced rights issue will mean that the rights will almost always be exercised and the underwriting fee associated with the trivial possibility of the put being exercised and the shares having to be distributed by the underwriter will then be trivial. It might then appear that a sufficiently underpriced rights issue is a near-costless way to raise additional equity. This is the logic in the *AER 2008 Draft Decisions for Electricity Distribution and Transmission*.

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<sup>2</sup> Lee, Lochhead, Ritter and Zhao (1996) is heavily referenced in Allen Consulting Group report on which the AER decision relies. Although Lee, Lochhead, Ritter and Zhao discuss and report the substantial indirect (underpricing) costs associated with IPOs, their paper does not report the indirect costs of SEOs. The ACG report omits any reference to the indirect costs of issuing equity.

17. But such a conclusion overlooks the fact that the original shareholders are then almost certain to have to bear the transactions costs associated with marketing the newly issued shares. The flawed logic in the preceding paragraph has become known in the finance literature as the rights offer paradox: *Why do companies apparently pay too much by raising additional equity via public issues rather than rights issues?* The answer is now well-accepted in the finance literature and is provided in Hansen (1988).

*[T]he lack of use of rights offerings ... can be explained by transaction-cost conditions. ... Firms making underwritten rights offerings paid lower underwriter fees but incurred significantly larger price drops just prior to the offering than did firms making underwritten public offerings. Further analysis reveals that the underwritten-rights-offering price concessions are a form of transaction cost that is not found in underwritten public offerings.*

18. Hansen reports that underwritten rights offerings are associated with a greater than 4% price decline in the 20 days just prior to the sale of new shares, a decline that does not occur with underwritten public offerings.

*The significant price dip around underwritten rights offerings suggests that shareholders who sell their rights or sell their shares obtained by exercising their rights incur additional unreported costs by having to sell their shares at depressed prices.*

19. Individual shareholders lack the client lists of underwriters and in order for them to find the large number of new buyers necessary to absorb the issue they must offer significant price concessions relative to the pre-issue share price. In contrast, and consistent with their relative expertise, underwriters are able to sell new common stock at higher prices off the exchange in public issues than existing shareholders can on the exchange.

20. Why then don't existing shareholders simply subscribe and hang on to the newly acquired shares. This would avoid selling at a depressed price their shares cum-rights or the rights themselves and avoid selling any newly acquired shares at a depressed price? There are many reasons to sell rather than subscribe and hang on:

- In order to subscribe the existing shareholders would have to bear the transactions costs of raising the subscription price, either by borrowing or by selling other assets.
- The sale of other assets can trigger the realization of a capital gain and the associated tax liability.
- An investor's portfolio would become overweighted in the particular stock relative to the preference revealed by his/her holdings prior to the rights issue. The investor is likely to become less diversified during the period they continue to hold additional shares acquired via the rights issue.

21. A rights issue can impose a further indirect transactions cost on the original shareholders over and above the rights-offering price concession documented in Hansen (1988) and the costs listed in the preceding paragraph. The sale of a right will trigger the taxable realization of a capital gain. If the underlying shares have

been held for less than 12 months the shareholders can lose up to 46.5% of the sale proceeds of the right.

22. The AER overlooks the indirect costs incurred by the existing shareholders in the event of a rights issue. These indirect costs are:
- The underwritten-rights-offering price concessions documented by Hansen in the event that the original shareholders sell their rights, or sell their shares prior to the ex-date of the rights issue in order to avoid receiving the rights, or sell their newly acquired shares in order to rebalance the portfolios after exercising their rights;
  - The transaction and tax costs associated with raising the necessary subscription price if the shareholder does wish to exercise his/her right;
  - The capital gain tax liability triggered by the sale of a right.
- None of these indirect costs occur when a firm raises additional equity via an underwritten public issue.
23. That the transactions and tax costs of either selling or exercising rights are non-trivial is attested to by the results of Balachandran, Faff and Theobald (2008). These authors report that the median fraction of renounceable but non-underwritten rights offerings that are not exercised (either by the original shareholder or a subsequent purchaser of the right) is 12.33%. This result implies that a significant fraction of investors find the transactions costs of exercising their in-the-money rights so prohibitive that they allow them to expire unexercised. In the absence of transactions costs either 0% or 100% of the rights in a particular issue would be exercised. Exercise would depend on whether the share price was below or above the subscription price.
24. The indirect transactions costs of the shareholders themselves marketing the new issue have grown over time as shareholdings have become more dispersed. Hansen gives this as the reason for the demise of the rights issue in the US. Eckbo and Masulis (1992) note the shift away from rights issues to underwritten public offers by large UK and Japanese firms that have experienced increased dispersion in their share ownership.
25. Rights offerings make up the minority of secondary offerings in Australia both by number of issues and amount of capital raised. Chan and Brown (2004) document that rights issues survive in Australia largely because of an ASX listing requirement that limits the annual issue of new shares by placement to 15% unless shareholder approval is obtained.<sup>3</sup> Chan and Brown calculate the cumulative issue ratio defined as the sum of the new shares issued by placement and by rights issue in a 12 month period relative to the existing shares outstanding and examine the relation between the cumulative issue ratio, the ceiling and the decision to issue shares via a rights issue. Chan and Brown report that:

*“Voluntary” rights issues – that is those where the cumulative issue ratio was less than the ceiling – are rare. Only 29 out of the 326 rights issues (8.9%) were voluntary and they represented only 1.3% of all issues.*

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<sup>3</sup> The ceiling was 10% prior to mid 1998.

26. While firms can and do seek and receive shareholder approval when the ceiling would otherwise be binding,<sup>4</sup> a company may choose to split the capital raising into a placement that just satisfies the ceiling and a rights issue for the additional capital. It may be optimal to split the raising in this manner if seeking shareholder approval would require that the firm call an extraordinary general meeting (EGM) in order to gain approval for the placement. Calling an EGM may falsely signal that the company has failed to anticipate its capital requirements and is unable to either delay the planned expenditure or obtain bridging finance until after the next AGM.
27. The underwritten-rights-offering price concessions documented in Hansen (1988) and the other indirect costs of rights issues discussed in paragraphs 20 and 21 above are consistent with companies' revealed preference for public issues rather than rights issues. The existence of rights issues as an alternative to the public placement of new equity provides no basis for assuming a lower cost of raising equity than is observed in the public placements that are actually used in practice.
28. It may be that the AER's reasoning that non-underwritten deeply discounted rights issues should be the preferred method of raising capital is coloured by the conclusion in Handley (1995) that underwriting fees for rights issues significantly exceed the value of the put option provided by the underwriter.<sup>5</sup> Even if it were the case that underwriting fees were not set competitively it does not follow that any overpricing of the put will exceed the indirect costs of a rights issue (overlooked by the AER). It also does not follow that a deeply discounted non-underwritten rights offering will have a lower cost than an underwritten public issue.
29. Handley's conclusion itself is flawed in that it overlooks the results of Hansen (1988). Handley values the put by taking as the measure of the value of a share the price of the share on the last day prior to the announcement of the rights issue. But Hansen has documented an average -1.37% abnormal return on the announcement and a further -4.03% abnormal return through the end of the exercise period. It is this final price (effectively 5.4% lower than the pre-announcement price) that will determine whether the right is exercised at its maturity. By using a value for the underlying shares that is 5.4% too high, Handley underestimates the value of the put. Underwriters and firms understand that the underwritten-rights-offering price concessions affect whether the rights are taken up and in turn whether the underwriter will have to bear the distribution costs of finding an eventual home for the shares they must acquire. Underwriters and firms recognize this in negotiating the underwriting fees they agree to.

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<sup>4</sup> Chan and Brown (2004) report that out of the total of 2,182 new issues by Australian listed companies between July 1996 and March 2001, 1,191 were placements that involved the company seeking and obtaining shareholder approval.

<sup>5</sup> Page 53 of Handley (1995) does recognize that an alternate explanation is that rather than underwriting fees being too high, it may be that the Black Scholes model used to value the put is inapplicable and that the appropriate option pricing model is an open empirical question. The Black Scholes model assumes that the stock price follows a continuous price path. The events associated with a calamitous failure of a planned new equity issue (which would generally lead to the exercise of the put) might be better described as giving rise to a price process with downward jumps, viz. the recent failure of the rights issue by the *Royal Bank of Scotland* underwritten by the government of Britain (more correctly the taxpayers of England) and the recent *Commonwealth Bank of Australia* capital raising debacle.



Underwriting fees will be higher than in the absence of the underwritten-rights-offering price concessions overlooked in Handley's calculations.

30. It would be inconsistent with both finance theory and empirical observation to assume as the AER does that issuance costs can be eliminated via the use of deeply-discounted rights issues. A deeply-discounted rights issue simply means that large indirect costs associated with distributing the new shares are shifted on to the shareholders who receive the rights.
31. The above point is true irrespective of the relative popularity of rights issues versus public placement. However, the preference of firms for public placement over rights issues provides compelling evidence not only that a rights issue does not eliminate these costs but also that a rights issue is, in general, higher cost than a public placement.
32. It is not a finding of the finance literature that rights issues involve lower costs than public placements. It is a finding of the finance literature that the extensive use of public placements in preference to rights issues can be explained by the fact that rights issues have a higher cost than public placements.

#### **4. Costs associated with financing via retained earnings**

33. When a firm optimally distributes dividends the benefit to its shareholders from the last dollar of dividends they receive is equal to the benefit they would have received if that dollar had instead been retained by the firm. Suppose a firm optimally pays dividends and sells new shares simultaneously. The foregone saving in issuance costs if the last dollar of dividends had instead been retained must then be equal to the cost imposed on the shareholders if the dollar is retained; i.e., the marginal cost of issuing a dollar of equity must equal the marginal cost of delaying the receipt of a dollar of dividends. The cost of financing with retained earnings is not zero. For a firm optimally distributing dividend while issuing new equity, the marginal cost of financing via retained earnings is identical to the cost of financing via a new equity issue.
34. The costs associated with reducing dividends below their optimal level have long been recognized in the finance literature. The Modigliani and Miller (1961) classic, "Dividend policy, growth and the valuation of shares," observed that investors will sort themselves into 'dividend clienteles'. Those who face a tax penalty on capital gains relative to dividends and those who face high transactions cost in funding their consumption by selling shares will be attracted to high yield stock. The documentation of dividend clienteles continues as a staple of empirical finance research today.<sup>6</sup> The optimal dividend policy for a regulated utility can not be determined without reference to the costs imposed on the current clientele if the regulatory regime assumes a lower payout ratio than that which attracted that clientele to the firm.

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<sup>6</sup> See, for example, Hotchkiss and Lawrence (2007) and the papers cited therein.

35. Agency costs associated with reducing dividends in order to fund a firm's investments have also been long recognized in the finance literature. Easterbrook (1984) models the benefits of the capital market discipline imposed when a firm distributes its earnings as dividends and then must convince new investors to fund the firm's projects. Imposing this discipline through a high dividend payout ratio reduces the potential for empire building recognized as the classic free-cash problem in Jensen (1986).
36. The imputation credits available to Australian domestic investors provide a third reason why retained earnings can be a costly source of finance. Retaining earnings reduces the present value of imputation credits. Imputation credits are not received by investors until the underlying earnings are distributed as a dividend. Pattenden and Twite (2008) document that the introduction of dividend imputation in Australia in 1987 led to a sustained increase in dividend payout ratios, with firms with higher franking credits choosing to distribute higher dividends.
37. It should be recognized that the pecking order theory developed in Myers and Majluf (1984) does not state that retained earnings are uniformly a cheaper source of funds than new equity issues. Myers and Majluf model corporate financing when firms have information that investors do not have. Absent an information asymmetry all forms of financing are equally good in the Myers-Majluf setting. Pecking order theory will accurately describe the world only when there is both an information asymmetry and in addition no free cash flow problems or negative tax or transaction costs implications when earnings are retained. Note that pecking order theory can not be a complete descriptor of firm financing decisions since it is inconsistent with the observed existence of dividend clienteles.
38. The finance literature recognizes that the costs of retaining earnings increase with the level of retained earnings and these costs can exceed the costs of an SEO. If this were not the case, we would never observe firms paying dividends with one hand while simultaneously raising new equity with the other.

## **5. Implications for the AER draft decision's analysis of the costs of raising equity**

### *Indirect cost of raising equity*

39. The AER considers that
- *no compensation is required for [indirect] costs because it would be inconsistent with the benchmark regulatory framework applied to determine the ... WACC*
  - *the efficient benchmark network service provider should be able to raise capital without incurring underpricing costs.*
40. The first dot point confuses the discount rate to apply in undertaking a valuation with the cash flows to be discounted. A claim that compensation for indirect costs is inconsistent with the regulatory framework is equally a claim that compensation

for direct costs is inconsistent with the regulatory framework. Both claims are fallacious.<sup>7</sup>

41. The second dot point reflects the AER's belief that a deeply discounted rights issue could raise the necessary capital without allowing a third party to capture the benefit of the underpricing. There would then be no need to compensate the firm for underpricing. But, as shown in Section 3, such a rights issue would involve a new indirect cost. The costs of distributing the new shares would now be borne by the firm's shareholders themselves. Shareholders are less-efficient marketers of new shares than investment banks. In fact, this high indirect cost of a rights issue is recognized by the finance literature as the reason for the demise of the rights issue over time.
42. Although a service provider may be able to use a deeply-discounted rights issue to raise capital without incurring underpricing costs, the shareholders of the service provider must bear this even larger indirect cost. If a service provider were to be required to use such an inefficient method of raising equity capital, it would have to be compensated for doing so if appropriate investment incentives are to be maintained.
43. Accordingly, the AER is also wrong in their assertion that a benchmark network service provider should be able to raise capital without incurring underpricing costs. Given the higher costs associated with alternate means of raising equity (summarised in paragraph 22 above) it is clear that the most efficient way for a benchmark company to raise equity is through an underpriced SEO and hence underpricing costs should be allowed.
44. Page 142 of the AER draft decision for *TransGrid* reviews the relation between underwriting fees and the value of the options implicit in an underwritten public offering and states that:

*the AER considers that there are actually strong arguments that the option component of the underwriting fee should not be paid. This is because the underwritten firm should expect to get a payoff with a present value equal to the fair value of the option.*

The AER draft decision recognizes only the put option provided by the underwriter to the firm and overlooks the more valuable call option provided to the underwriter of an underpriced public issue. Section 2 discusses the importance of both options and shows that the net value of the two options is equal to the level of underpricing. As shown in Section 2, the cost of an underwritten public offering is the total of the underwriting fee less the value of the put; i.e., the total of the (direct) underwriting fee and the (indirect) underpricing cost.

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<sup>7</sup> The AER claim on page 142 that the CAPM assumes that all investors have the same required return is both beside the point and false. The CAPM is often referred to as the Sharpe-Linter CAPM to recognize its joint parentage. Linter (1965) developed the CAPM assuming that investors have heterogeneous beliefs. The CAPM then applies with the expectations described by the model being a weighted average of individual investor expectations with weights that reflect each investor's wealth and risk aversion

*Equity raising requirement—cash flow analysis*

45. Pages 142 through 144 of the AER draft decision for *TransGrid* sets out a methodology to determine benchmark equity raising costs. That methodology assumes that any dividend in excess of a 3.5% yield could instead be costlessly applied toward funding the equity component of capex. On page 145 the AER proposes a new approach of assuming any dividend in excess of a 70% of accounting profits can be costlessly applied to funding the equity component of capex. Section 4 has established that financing with retained earnings is in fact not costless. If the regulatory framework is based on a suboptimal retention policy then the costs imposed on the regulatory entity would have to be compensated if appropriate investment incentives are to be maintained.
46. Page 144 of the AER draft decision for *TransGrid* contains a claim that a policy of paying dividends in excess of a firm's accounting profits is unsustainable. It is basic finance theory that only an ongoing dividend yield *in excess of a firm's cost of equity* is unsustainable, and then only in the sense that such a distribution policy would require the ongoing issuance of new securities in order to avoid shrinkage of the firm. Note that the CEG report titled *Nominal risk free rate, debt risk premium and debt and equity raising costs for TransGrid* and dated May 2008 did *not* propose a dividend yield in excess of the firm's cost of equity.<sup>8</sup>

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<sup>8</sup> A dividend yield in excess of the firm's cost of equity is in fact sustainable when new securities are issued through time: Shareholders will receive their return each period as a dividend plus a capital loss. Shareholders will suffer a capital loss as their positions are diluted by the issuance of the new securities necessary to fund the ongoing venture.

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**Academic Positions**

Professor of Finance, University of Melbourne 2005-  
Adjunct Professor of Finance, The Wharton School, University of Pennsylvania, 2005-2007.  
Ian Potter Professor, Melbourne Business School, 2000-2005.  
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Visiting Professor, Singapore Management University, Fall 2005.  
Visiting Professor, University of Chicago, 2003  
Metzler Bank Professor, Johann Wolfgang Goethe-Universität Frankfurt am Main 1998.  
Visiting Professor, Macquarie University, 1994.

**Publications**

"Combining skill and capital: Alternate mechanisms for achieving an optimal fund size," 2008, forthcoming *Pacific Basin Finance Journal*.  
"Disclosure, hidden charges and indexed pensions," 2005, *Agenda: A Journal of Policy Analysis and Reform*, 12(1), pp. 33-46. Co-authors: Diana Beal and Sarath Delpachitra.  
"Stock market volatility in a heterogeneous information economy," 2002, *Journal of Financial and Quantitative Analysis* 37(1), pp. 1-27. Co-author: Youngsoo Kim.  
"Momentum: Fact or factor? Momentum investing when returns have a factor structure," 2001, *Review of Financial Studies* 14(1), pp. 29-78. Co-author: Spencer Martin.  
"Merton H. Miller: His contribution to financial economics," 2001, *Journal of Finance* 56(4), pp. 1183-1206.  
"Generalized properties of option prices," 1996, *Journal of Finance* 51(5), pp. 1573-1610. Co-authors: Yaacov Bergman and Zvi Wiener.

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- “Option prices and the underlying asset’s return distribution,” 1991, *Journal of Finance* 46(3), pp. 1045-1070.
- “Changing risk, changing risk premiums, and dividend yield effects,” 1990, *Journal of Business* 63(1), pp. 51-70. Co-authors: Nai-fu Chen and Robert F. Stambaugh.
- “Optimal investment with stock repurchase and financing as signals,” 1989, *Review of Financial Studies* 2(4), pp. 445-465. Co-author: George Constantinides.
- “Trade and the revelation of information through prices and direct disclosure,” 1989, *Review of Financial Studies* 2(4), pp. 495-526. Co-author: Maureen McNichols.
- “Call and conversion of convertible corporate bonds: theory and evidence,” 1986, *Seminar on the Analysis of Security Prices* 31, pp. 35-70. Co-author: George Constantinides.
- “The behavior of stock prices around ex-dividend dates,” 1983, *Seminar on the Analysis of Security Prices* 28, pp. 83-114.

### **Edited Volumes**

- Selected Works of Merton Miller: A Celebration of Markets. Vol I Finance*, 2002 (University of Chicago Press, Chicago, Ill).
- Selected Works of Merton Miller: A Celebration of Markets. Vol II Economics*, 2002 (University of Chicago Press, Chicago, Ill).

### **Other**

- “Book Review: *Pricing and hedging of derivative securities* by Lars Tyge Nielsen,” 2000, *Journal of Financial Research* 23, pp. 391-394.
- “Stock return predictability in rational markets,” 2007, *Insights: Melbourne Economics & Commerce* 1, pp. 35-40.

### **Working Papers currently in review process**

- “Optimal exercise and valuation of real options: The effects of uncertainty and asymmetric information,” 2007. Co-author: Johannes Raaballe.
- “The Analysis of VaR, deltas, and state prices: A new approach,” 2007. Co-author: Zvi Wiener.
- “Leadership giving in charitable fund-raising: Matching grants or seed money?” 2007. Co-author: Ning Gong.

### **Work-in-Progress**

- “Do socially responsible firms add value for their employees? – A theoretical examination of corporate employee matching grant programs,” Co-author: Ning Gong.
- “Valuing complex compensation packages,” Co-author Steve Usher
- “Macroeconomic and microstructure determinants of implied volatility,” Co-author Paul Kofman
- “A rational model of momentum and contrarian return behaviour,” Co-authors Wei Li and Joe Zhang



“Storage and the Hotelling valuation principle: Understanding the dynamics of the oil industry,” Co-author Richard Heaney

“Multiplicative risk prudence,” Co-authors: Xin Chang and George Wong.

“Option prices, implied abnormal returns and momentum,” Co-authors: Greg Clinch, John Lyon and Gary Twite.

“Differential Information and Derivatives Pricing,” Co-author: Qi-Zeng.

### **Awards**

1998 Geewax-Terker Prize, 1994-95 Batterymarch Fellowship, 1994 Hauck Award, 1993 Outstanding Teaching Award (Wharton), 2007 FEC Teaching Award

### **Grants**

National Science Foundation Grant, “Call and conversion of convertible bonds” 1985-1987, joint with George Constantinides, US\$300,000

Australian Research Grants Council Discovery Grant, “Storage and the Hotelling Valuation Principle: Understanding the Dynamics of the Oil Industry” 2007-09, joint with Richard Heaney. \$345,000

Australian Research Grants Council Discovery Grant, “Three Decades of Financial Distress and Corporate Restructuring in Australia” 2008-10, joint with Paul Kofman and Howard Chan. \$104,537

### **Professional Society Activities**

Director: Asian Finance Association

Founding Member: Australian Financial Integrity Research Network

Fellow: Australian Society of Certified Practicing Accountants.

Member: Asian Finance Association, American Economics Association, American Finance Association, American Mathematical Society, European Finance Association, Western Finance Association.

Reviewer: Australian Accounting Research Foundation Exposure Draft on Director and Executive Disclosures.

Doctoral Colloquium Fellow: AFAANZ 2003 Colloquium, 2005 Colloquium.

Doctoral Consortium Fellow: AFAANZ 2004 Consortium

Doctoral Consortium Fellow: Asian Finance Association 2005

Australian Society of CPA’s 1999 Research Lecture

Founding Member Financial Integrity Research Network (FIRN)

FIRN Doctoral Tutorial Discussant: 2005-07.

FIRN Local Convener: 2006-08.

Managing Editor:

*International Review of Finance*, 2004-2008

Associate Editor:

*Journal of Finance*, 2000-2003

*Journal of Financial Research*, 1999-2006

*Accounting and Finance*, 1999-2002.

*Journal of Financial and Quantitative Analysis*, 1992-1996.

*Review of Financial Studies*, 1988-1994.

Editorial Board:

*Accounting and Finance*, 2002-present  
*Business Research*, 2007-present

Ad Hoc Referee:

*Agenda*, *American Economic Review*, *Australian Journal of Management*, *Accounting and Finance*, *European Economic Review*, *European Journal of Finance*, *Financial Management*, *Financial Review*, *Journal of Accounting Research*, *Journal of Business*, *Journal of Business and Economic Statistics*, *Journal of Finance*, *Journal of Financial Economics*, *Journal of Financial Intermediation*, *Journal of Political Economy*, *Journal of Public Economics*, *Management Science*, *Mathematical Finance*, *Review of Accounting Studies*, *Review of Quantitative Finance and Accounting*, *Review of Financial Studies*, *Quarterly Journal of Economics*.

Program Committee:

American Economics Association Meetings: 1998.  
American Finance Association Meetings: 2001.  
Asian Finance Association Meetings: 2004, 2005, 2006, 2009.  
European Finance Association Meetings: 2000, 2001, 2002 and 2005.  
European Financial Management Association Meetings: 1999.  
Financial Management Association Asia Meetings: 2009  
Indiana University Symposium on Design of Securities and Markets: 1993.  
Journal of Accounting Research Annual Conference: 2002, 2003.  
MDRG Annual Conference 2009  
Western Finance Association Meetings: 1990-91, 1994-95, 1997-98, 2004, 2007-09.  
Review of Accounting Studies Annual Conference: 2004, 2005.

Reviewer:

Research Grants Council of Hong Kong: 1997, 2000, 2004 and 2005.  
National Science Foundation Proposals: 1990, 1991, 1994 and 1997.  
Australian Research Council: 1994, 1995 and 2007.  
Social Sciences and Humanities Research Council of Canada: 1993 and 1994.

Discussant:

American Finance Association Meetings: 1986-900, 1994-95, 2006.  
Annual Conference on Financial Economics and Accounting: 1992 and 1996.  
ANU Summer Camp: 2008  
Asia-Pacific Finance Association Meetings: 1999.  
Asian Finance Association Meetings: 2004-06.  
European Finance Association Meetings: 1995, 2002, 2005.  
Fifth Annual Texas Finance Festival: 2003.  
Paul Woolley Centre on Capital Market Irrationality Conference: 2008  
Ph.D. Conference in Economics and Business: 1999.  
Simulation Based & Finite Sample Inference in Finance Conference: 2003.  
Singapore International Conference on Finance: 2008  
Western Finance Association Meetings: 1993 and 1997.

Session Chair:

Accounting & Finance Association of Australia and New Zealand Meetings: 2003-05.  
Asian Finance Association Meetings: 2004-06.  
Australasian Finance & Banking Conference: 2003  
American Finance Association Meetings: 2001.

European Finance Association Meetings: 2002, 2005.  
Western Finance Association Meetings: 1995.

Keynote Speaker:

Accounting & Finance Association of Australia and New Zealand Meetings: 2003.  
Australasian Banking & Finance Conference: 2002.

Organizer:

The Dollars and Sense of Bank Consolidation: MBS Conference 2002.  
Risk Management and Pricing for Financial Institutions: Lessons from the Closed-  
End Fund Industry: Wharton Financial Institutions Center Conference 1995.  
Derivatives Down Under Conference: 2007, 2008.

Panelist:

Tax Issues in Capital Structure and Dividends. Uni. of Chicago, GSB Conference  
1994.

Conference Presentations:

34th Conference of Economists: 2005.  
Asian Finance Association Meetings: 2004 and 2005.  
Australasian Q-group: 1999, 2004.  
HKUST Finance Symposium: 2004.  
Third National Symposium on Financial Mathematics: 2004.  
AGSM Finance and Accounting Camp: 1996, 1997 and 1999.  
American Finance Association Meetings: 1986, 1989, 1990, 1996, 1997 and 1998.  
NBER Summer Institute: 1998.  
Annual Conference in Financial Economics and Accounting: 1995 and 1996.  
American Mathematical Society Meetings: 1996.  
European Finance Association Meetings: 1995, 2002, 2005.  
NBER Financial Risk Assessment and Management Conference: 1995.  
N.J.C.R.F.S. Conference in Security Design and Innovations in Financing: 1993.  
Western Finance Association Meetings: 1984, 1989 and 1993.  
Sixth Annual Conference MSMESB: 1991.  
Australasian Banking and Finance Conference: 1989 and 2007.

Finance Seminar Presentations:

Aarhus, Alberta, Australian Graduate School of Management, Australian National  
University, Bond University, Boston College, Carnegie-Mellon, Central Queensland  
University, Chicago, Columbia, Commodity Futures Trading Commission, Cornell,  
Dartmouth, Duke, Fields Institute, Frankfurt am Main, Hong Kong University of  
Science and Technology, Houston, Humboldt, Insead, London Business School,  
London School of Economics, Macquarie, Maryland, Massey University, Melbourne  
Business School, Michigan, Minnesota, MIT, Monash, Monash-Mt Eliza, National  
University of Singapore, New York University, Northwestern, Odense, Ohio State  
University, Oregon, Queens, Queensland University of Technology, Rutgers,  
Singapore Management University, Stanford, University of Adelaide, University of  
British Columbia, University of California Berkley, University of California Irvine,  
University of California Los Angeles, University of Illinois Champaign, University  
of Melbourne, University of New South Wales, University of North Carolina Chapel  
Hill, University of Queensland, University of Sydney, University of Technology

Sydney, University of Western Australia, Vanderbilt, Victoria University Wellington, Washington University, Yale.

Manuscript Reviewer:

University of Chicago Press, Cambridge University Press, Academic Press.

## **Teaching Experience**

*Derivatives-related courses:* Honours, Masters and PhD courses on options, futures, swaps, mortgage-backed securities and exotics.

*Corporate Finance-related courses:* Honours, Masters and PhD courses on capital budgeting, mergers and acquisitions, corporate taxation, agency problems, information asymmetries, and security design.

*Corporate Governance:* MBA course

*Real Options and Resource Projects:* Undergraduate and MBA courses

*Financial Management:* Executive MBA course

*Executive Education:*

ABN Amro, Australian Graduate School of Management, KPMG, Liechtenstein Global Trust, Melbourne Business School, PaperLinx, PWC, Susquehanna Investment Group, Telstra Risk Management and Assurance, Turkish Capital Markets Board, Wharton School Pension Funds and Money Management Program

*Member of Thesis Committees.*

*Completed:* Mahmoud Agha (University of Western Australia), Ken Bechmann (Copenhagen Business School), Jacob Boudoukh (New York University), Jennifer Carpenter (New York University), Adam Dunsby (Goldman Sachs), Michael Gallmeyer (Carnegie-Mellon), Pekka Heitala (Insead), Terry Hildebrand (Enron), Ron Kaniel (University of Texas), Youngsoo Kim (Alberta), Michele Kreisler (Morgan Stanley), Guan Hua Lim (University of Singapore), Hui Li (Deakin), Spencer Martin (Ohio State), Krishnan Maheswaran (Melbourne University), Ed Nelling (Georgia State), Ian O'Connor (Melbourne University), Rob Reider (J.P Morgan), Mark Vargus (University of Michigan).

*In Progress:* Zhenhua Liu, Alya Al Foori, Yang Yang Chen

*External Examiner:* Aarhus University, University of Technology Sydney, University of Sydney, University of Western Australia, University of New South Wales.

## **Administrative Positions**

University of Melbourne

Cost Containment Committee, 2007.

Business@Melbourne Coordinating Committee, 2007-2008.

Melbourne Business School Committee, 2006-2008.

University of Melbourne, Faculty of Economics & Commerce:

Deputy Dean, 2006-2007.

FEC Advisory Board, 2007-2008.

Convener Melbourne Derivatives Research Group, 2006-2008.

Convener Finance Seminar, 2007-2008.  
Research and Research Training Committee: 2007.  
PhD Coordinator, Department of Finance: 2007  
Accounting and Finance Department Committee, 1999.  
Research and Research Training Committee, 1999.

University of Melbourne, Melbourne Business School:

Director Ian Potter Center for Financial Studies, 2000-2005  
Academic Planning and Development Committee, 2002-2005.  
Curriculum Committee, 2002-2005.  
Seminar Convener, 2000-2005.

The Wharton School:

Convener Corporate Finance Workshop, 1995-1997.  
Wharton Fellows Fund Selection Committee, 1993-1997.  
Recruiting Committee, 1995-1996.  
Finance Seminar Convener, 1992-1994.

Stanford Graduate School of Business:

Finance Seminar Convener, 1988-1990.  
Deans Advisory Committee, 1986-1988.