



# COMPETITION & REGULATION TIMES

IN THIS ISSUE

JULY 2007

ISSUE 23

- 1 I'll give .... if you do (maybe)
- 3 To 'partner up' or not 'partner up'
- 4 There was sigma in them thar hills
- 6 The economics of climate policy
- 8 Incentives and competition in the ivory tower
- 10 Does substitute trading make insider-trading regulations ineffective?
- 10 Managing the risk of power shortfalls
- 12 Management shareholding ain't all it's cracked up to be

## I'll give ... if you do (maybe)



What leads people to donate to a worthy cause? And what determines how much they give? Buskers, galleries, and other fundraisers have been collecting anecdotal evidence for years – and now work undertaken by Victoria University economists at Wellington's City Gallery has been able to formalise some aspects of donation behaviour. John Randal describes the results of this research.<sup>1</sup>

**M**otivated by an American radio station's telethon, in which callers were told (by researchers) that 'the last caller gave \$250, how much would you like to give?', the research manipulated the contents of City Gallery's see-through donation box in a series of experiments conducted over a three-year period. Unlike callers to the telethon, who were already committed to giving, visitors to the gallery were faced with an initial decision: should I give a donation? If the answer was yes, they then had to decide: how much should I give? The results of the study show that the existing contents of the box affect both of these decisions. And, to a lesser extent, so do messages placed on the box.

For each day in the analysis, the donation box at City Gallery was loaded with a very specific quantity

and combination of notes and coins. At the end of the day, this 'seed' money was removed and contributions were recorded.

During the day, City Gallery monitored visitor numbers. An overhead camera also recorded video footage of people putting money into the donation box – and, every so often, someone pretending to do so!

### Follow the leader

One of the most robust findings in the study is that the money put into the donation box mimics the money that is already in there. If a relatively large number of notes are present in the box, donations are more likely to be note donations. If there are a relatively large number of coins in the box, donations are more likely to be coins.

Just as the size of the donations given by the radio station's telethon

callers was influenced by the previous (fictitious) donation quoted by the researchers, new donations at City Gallery are apparently influenced by the perceived size of previous donations.

### A bigger or smaller bang for the buck?

Given such mimicking tendencies, it might seem that the best policy would involve loading donations boxes up with notes (possibly of high denomination). However, further experiments revealed that doing so comes at a cost: a lower propensity to donate.

The seed money was fixed at \$100. When its composition was altered in favour of notes, there was an increase in the number of notes donated – but the total number of donations fell. Seeding the box

to page 2

### Corporate Members of NZISCR are:

- Contact Energy Ltd
- Fonterra Co-operative Group Ltd
- Meridian Energy
- Powerco Ltd
- Telecom Corporation of New Zealand
- Transpower New Zealand Ltd
- Vector Ltd
- Victoria University of Wellington
- Westpac Institutional Bank

from page 1

predominantly with notes tended to net a small number of large donations; seeding it mainly with coins resulted in a large number of small donations.

But how much larger or smaller? From the gallery's perspective, the crucial issue is whether the 'mimicking' or the 'propensity' effect tends to dominate. That is, do total donations rise or fall with the proportion of notes in the box?

It turns out that the seed contents have little impact on overall donation levels. On days when the box started off empty, the average donation was almost exactly \$2 (a gold coin). By contrast, silver coins (50c or less) were much more likely when the box was loaded with predominantly silver coins; and notes (\$5 or more) were more likely when the box had many notes in it. Clearly, the average donation per donor rose with the average contents of the box. However, this was almost exactly offset by the reduced propensity to donate – that is, there was a smaller number of donors. So the average donation per visitor remained approximately constant.

#### **A wink and a nudge**

Can other strategies encourage more and bigger donations?

In one experiment, donors were thanked with a sign that said 'City Gallery Wellington Foundation thanks you for your donation' on all four sides of the box. When there was a large amount of money in the box, this tended to have a negative effect on the proportion of visitors who donated. But when there was little money in the box, the sign had a positive impact.

Another experiment promised to match donations, indicated by a sign saying 'Cash donations today will be matched by City Gallery Wellington Foundation'. This had a positive effect on donation propensity, regardless of the amount in the box.

Two other experiments disclosed the existence of the study to visitors. In the first, visitors were told that donations were being

'counted'; in the second, they were told that donations were being scrutinised ('monitored and analysed'). There was no effect on propensity from 'counting' the donations. Scrutiny, however, had a large effect – and the direction of this effect depended on the composition of the box. Under scrutiny, and when there was a large number of notes in the box, the number of people who gave was approximately halved; but when there was a large number of coins in the box, the number of people who gave was almost doubled.

**The actual norm  
is to  
give nothing.  
Approximately 98%  
of visitors chose  
not to donate.**

Interestingly, male donors appeared to be more influenced by the disclosure of scrutiny than females. In particular, the composition of donations by male visitors was significantly different when they believed their behaviour was being observed. When the box was laden with notes and the scrutiny sign was in place, the male donors gave more notes than would be expected. Similarly, when faced with a coin-laden box that was reportedly being scrutinised, males were much less likely to make larger (note) donations.

#### **What should be done?**

In general, the average donation was affected more by the particular exhibition on at the time than by the manipulations contained in the experiments. Nevertheless, these did have a significant impact; and the behaviour

they revealed is consistent with a model of social norms which in lay terms means that people want to act as others have done. Little do they know that the actual norm is to give nothing. Approximately 98% of visitors chose not to donate, and the average donation per visitor over the data-collection period was a measly five cents.

Notwithstanding this general disinclination to donate, the results of the experiments do tell us something. They imply that the revenue-maximising decision, holding the art on display constant, would be to have a moderate amount of seed money of mixed composition. A moderate amount, because too much money in the box tended to stifle people's willingness to donate. Mixed composition, because having only a few notes in the box made people reluctant to donate notes but having many notes in the box made people reluctant to give smaller donations.

For organisations that depend on donations, the most important issue is what they can reasonably hope to achieve through 'entry by donation'. Entry to City Gallery is free, and it receives less than five cents per visitor via the donation box. Perhaps an alternative would be to demand ten cents (currently New Zealand's smallest coin) from every visitor – so that entry truly would be 'by minimum donation'. Assuming it would not result in halving the number of visitors, this approach would yield more revenue than the current 'honesty box'.

<sup>1</sup> This article is based on: RP Martin and JA Randal. 2007. 'How is donation behaviour affected by the donations of others?' *Journal of Economic Behavior and Organization* (forthcoming). A copy is available at [www.vuw.ac.nz/staff/john\\_randal/research.html](http://www.vuw.ac.nz/staff/john_randal/research.html).

**John Randal** is a senior lecturer in the School of Economics and Finance at Victoria University of Wellington.

**ISCR Competition & Regulation Times** is the newsletter of the New Zealand Institute for the Study of Competition and Regulation Inc.

PO Box 600, Wellington, New Zealand. Ph: +64 4 463 5562, fax: +64 4 463 5566, e-mail: [iscr@vuw.ac.nz](mailto:iscr@vuw.ac.nz), website: [www.iscr.org.nz](http://www.iscr.org.nz)

The ISCR editorial team for this issue was Glenn Boyle and April-Mae Marshall.

The views expressed in **ISCR Competition & Regulation Times** are the views and responsibility of the contributing authors.

ISSN 1175-2912

# To 'partner up' or not 'partner up': the choice of organisational form

Professional services such as law, accounting, and medicine are typically organised as partnerships. However, in other service industries – as well as in the manufacturing and technology sectors – corporations are the norm. Glenn Boyle and René Le Prou look to explain this dichotomy.<sup>1</sup>

**P**artnerships are frequently observed in the professional services industry but are noticeably absent elsewhere. Various explanations for this phenomenon have long existed, based on differences in the ease of internal monitoring and decisionmaking, but it may have as much to do with the selection of workers as it does with their motivation once employed.

To see why, consider first the corporate form of organisation. Because a corporation wishes to maximise total profits, it continues to hire workers up to the point where the additional value from doing so is exactly offset by the additional wage cost. By contrast, a partnership wishes to maximise profits per partner, so it continues to take on partners up to the point where the additional value from doing so is equal to the average profit share of existing partners. Because this hiring threshold is higher than that used by the corporation, average worker quality will be greater in partnerships than in corporations, but total profits will be lower because some profitable workers are not hired.

Why then do we see a proliferation of partnerships in some industries but not in others? The answer may lie in the ability of clients to observe and assess the quality of a firm's output. When this task is straightforward, the conclusion above applies: corporations hire efficiently but partnerships are too selective and consequently less profitable.

A different picture emerges when it is difficult to monitor output quality. In this case, both partnerships and corporates have an incentive to expand by hiring employees who are less able, since they will benefit to the extent that clients are unable to detect the resulting reduction in quality. This moves corporations away from the efficient hiring level; but it shifts partnerships, which would otherwise hire too few workers, towards optimal hiring. Clearly, for sufficiently high

uncertainty about quality, partnerships will be closer to the efficient level of hiring than corporations.

Deviations from efficient hiring also have implications for profitability. Consider a firm whose output quality is difficult for outsiders to determine. Such a firm will 'over-employ', since it expects to be able to externalise some of the costs of doing so and pass them on to clients. However, clients rationally anticipate such behaviour, driving down the price they are prepared to pay for the firm's output. If this firm is organised as a partnership, then clients view its expansionist behaviour as being at least partly compensated by its structural 'under-employment' tendencies, and therefore apply a lower price-discount than they would if it were a corporation. For quality uncertainty beyond a certain level, profits are therefore higher if the firm is organised as a partnership than as a corporation.

This story suggests that partnerships will be common in situations where product quality is difficult to determine, while corporations will dominate when this isn't true. Intriguingly, high quality uncertainty is a vital characteristic of professional service

industries: it is difficult for clients to assess the quality of medical care or legal advice as they usually know little about such specialist fields. By contrast, outputs in the manufacturing and technology sectors are normally much less opaque, and firms in these industries typically incorporate.

More concrete evidence that quality uncertainty matters for organisational form comes from within the professional service field of accounting. In that industry, there are two principal activities: tax preparation and auditing. Because tax preparation is

less opaque than auditing, primarily because of the existence of tax-preparation software, we might expect that firms specialising in the former will tend to incorporate, while those specialising in the latter will opt for partnerships. US Census 1997 data confirms this: it reveals that 67% of revenues generated by tax-preparation firms were through corporations, while only 4% were through partnerships. On the other hand, 61% of revenues generated by auditing firms were through partnerships, with 32% through corporations. Similar patterns also arise in the consulting and legal industries.

When you next need to visit a doctor, lawyer, accountant, or any other professional, you're likely to be at an information disadvantage. Check their organisational form before making an appointment.

<sup>1</sup> This article is based on: J Levin and S Tadelis. 2005. 'Profit Sharing and the Role of Professional Partnerships' *Quarterly Journal of Economics* 120(1) pp131-171.

**Glenn Boyle** is ISCR's Executive Director.  
**René Le Prou** is a former Masters student at ISCR.

# There was *sigma* in them thar hills ...



How astute are financial market traders? Some view traders as shrewd sharks, while others consider them to be mindless lemmings who follow one another from one 'hot' investment sector to the next. And might their ability depend on the level of market competition? Lyndon Moore travels back in time – and across the Indian Ocean – to find out more.<sup>1</sup>

One way to determine the insightfulness of financial market traders is to assess how well they can use simple heuristic methods to price securities in the absence of a formal model. Complex valuation models now exist for virtually any security one can think of, but this is a relatively recent phenomenon. Before the development of such models, were traders capable of settling on prices that approximated fair value?

To address this question, historical price data are required. Warrants (similar to call options) listed on the Johannesburg Stock Exchange (JSE) in the early 20th century offer a rich source of such information. They allow an assessment of how well investors could value such securities, even though a formal theory of option pricing did not exist at the time (and would not exist until the appearance of the seminal work of Black, Scholes and Merton in 1973).<sup>2</sup>

Options were a feature of the Johannesburg gold rush from the beginning. The initial scramble to secure good mining ground was often characterised by leases with

an option to buy later. Then – beginning in 1908, but concentrated between 1917 and 1921 – companies that required additional working capital began offering bearer warrants to their shareholders. Two sources of price data for these securities have survived until today: daily prices for 15 market-traded warrants listed on the JSE between 1909 and 1922, and the call-option quotes of a single stockbroker between January 1908 and May 1911. By comparing these prices to Black-Scholes-Merton model prices, it is possible to assess the competency, or otherwise, of financial market traders.

## The rush to sigma

The most important input in the Black-Scholes-Merton model is sigma – the volatility of the stock on which the warrant is written. Because early 20th century investors did not have access to the Black-Scholes-Merton model, they did not explicitly estimate sigma. However, it is certainly possible that they did so implicitly. Indeed, the literature of the time advised investors to 'ascertain the past average

fluctuations over a considerable period of time of the stock to be operated in'.<sup>3</sup>

Of the 15 JSE-traded warrants, 11 were issued by gold mining companies, two by silver mining companies, one by a diamond mine, and one by an alkali extractor. The market prices of these securities were consistently greater than indicated by the Black-Scholes-Merton model, with the average absolute percentage difference between the two being around 25%.<sup>4</sup> Early 20th century investors were apparently unable to accurately estimate fair value; instead, they systematically exceeded this value. There are two possible explanations for such pricing errors: either investors implicitly used higher sigmas than could reasonably have been expected to occur (thus inflating prices); or they accurately estimated sigma, but were unable to accurately process that information in order to come up with something close to Black-Scholes-Merton prices.

One way of distinguishing between these competing explanations is to see whether a simple change to the sigma value used in the

Black-Scholes-Merton model will eliminate much of the error. In fact, for 13 of the 15 warrants, a single higher sigma is sufficient to drive the Black-Scholes-Merton prices much closer to actual prices over the entire period during which those warrants traded. This suggests that the pricing errors are more likely to have been caused by an over-estimate of sigma than by irrational investors.

#### Johannesburg calling

The stockbroker-quote data provide similar evidence – 77.6% of these quotes were higher than the corresponding Black-Scholes-Merton values. However, this overpricing was not uniform across time. The average absolute percentage difference was 10.4% in 1908 and 1909, but 52.4% in 1910 and 1911. What caused this massive increase? The contemporary evidence suggests a simple, but revealing, explanation: significantly reduced competition in the market for writing call options after an Act of Parliament halted all advertising by stockbrokers in October 1909.

The costs of mispricing were not trivial. An investor who followed a naive trading strategy of purchasing one of every call option quoted by the stockbroker and then holding it to maturity would have spent £863.1 between 1908 and 1911, and earned a gross payout of £457.8 from exercising those options that finished in-the-money. Thus, an investor would have recouped only 53% of his or her money spent on call options in Johannesburg.

Other evidence also supports the view that mispricing was primarily due to factors other than trader irrationality. One of the principal results of the Black-Scholes-Merton model is that warrants on stocks which do not pay dividends should not be exercised early, except in special circumstances. The exercise decisions of JSE investors were very close to this recommendation. For most stocks that did not pay dividends, warrant holders delayed exercise until the last possible opportunity. When they did exercise early, it was typically only one or two months ahead of the expiration date.

How do modern traders compare with their early 20th century counterparts? Somewhat surprisingly, given that the Black-Scholes-Merton model (or its variants) is now available to guide traders, modern traders perform little or no better. During 2002 and 2003, the average pricing error of JSE mining derivatives (18 call options and one warrant)

**Somewhat surprisingly,  
given that the  
Black-Scholes-Merton  
model or a variant  
is now available  
to guide traders,  
modern traders  
perform little or  
no better than  
their early  
20th century  
counterparts.**

ranged from 30% to 35%. A further 14 call options written on industrial companies fare even worse – the average pricing error for these securities was around 40%.

Clearly, pricing errors on the modern JSE are at a similar level to those occurring in the early 20th century. This suggests that the development of a formal pricing model has not greatly improved investors' abilities to accurately price derivatives – they apparently understood (intuitively) how to value derivatives long before any model was developed.

#### Not so irrational

What explains the continued mispricing on the JSE? Is it due to trader stupidity, or to some other factor?

A plausible candidate is the institutional structure of the JSE derivatives market: small

size, illiquidity, and a lack of direct price competition among option writers. This explanation can be tested by comparing the JSE pricing errors with those for corresponding securities in the more liquid US market.

For a set of 24 call options written on US mining and industrial stocks, the average pricing error is currently between 10% and 15%, significantly lower than on the JSE. Investors in US markets are obviously pricing derivatives more accurately than are JSE investors, exactly what one would expect given the greater liquidity, increased price competition, and standardised contracts prevailing in the US markets.

Taken together these results suggest that market competition, whether among rival brokers or through exchange-trading opportunities for investors, is more important than the availability of a formal pricing model in driving securities prices to fair value.

While development of a rigorous theory of option pricing has been invaluable for providing a complete understanding of the factors that influence the value of derivatives, early 20th century investors in Johannesburg appear to have been able to process relevant information in the manner required for determining the fair value of derivatives. Despite its current popularity in some areas of economics, there appear to be limits to explanations based on irrationality.

- 1 This article is based on: L Moore and S Juh. 2006. 'Warrant pricing 60 years before Black Scholes: evidence from the Johannesburg Stock Exchange' *Journal of Finance* 62 pp3069-3098.
- 2 F Black and M Scholes. 1973. 'The pricing of options and corporate liabilities' *Journal of Political Economy* 81 pp637-654.  
R Merton. 1973. Theory of rational option pricing. *Bell Journal of Economics and Management Science* 4 pp141-183.
- 3 L Higgins. 1906. *The Put-and-Call*. Aberdeen University Press.
- 4 The average absolute percentage difference is defined as  $100 * |C_{JSE} - C_{BSM}| / C_{BSM}$  averaged over all observations, where  $C_{JSE}$  is the market price and  $C_{BSM}$  is the Black-Scholes-Merton price.

**Lyndon Moore** is a lecturer in the School of Economics and Finance at Victoria University of Wellington. Originally from Tasmania, he regrets mispricing an option on the Australian cricket team to win the World Cup.

# a STERN look at the ECONOMICS of CLIMATE policy



Climate change has been the highest profile issue in environmental politics for more than a decade, and political interest has reached a fever pitch over the past year. But while the science underlying this issue has been widely exposed, the economics has struggled to escape from academic circles and learned journals. Anthony Heyes brings it into the light of day.

**O**ctober 2006 saw the publication in the United Kingdom of the 'Stern Review'. This 700-page analysis put together by Sir Nicholas Stern – Professor of Economics at the LSE, head of the UK's Government Economic Service, and until 2003 Chief Economist at the World Bank – said that climate change could shrink the global economy by as much as 20%.

While dissent is not hard to find, the scientific community has arrived at something close to consensus: climate change is occurring and human economic activity is contributing to it. The economic question is: 'so what should we do about it?'

The Stern team's economic modelling suggested that policy to substantially reduce climate change by stabilising greenhouse-gas

concentrations at 550 parts per million CO<sub>2</sub>-equivalent would be a good 'investment' (that is, it would raise global net present value) and called for substantial and immediate policy action to reduce greenhouse-gas emissions.

Compared with most pre-existing analyses, the Stern Review came up with substantially higher estimates of the value of damages from climate change, and lower estimates of the costs of emissions reduction. As a result, the 'headline' figure for the environmental 'price' of a tonne of carbon dioxide implied by the review is around US\$85. Recent estimates from a variety of good-quality sources have put the figure at less (and often much less) than US\$15; the

recent abortive proposal to introduce a carbon tax in New Zealand suggested a figure of NZ\$15.

Because of this significant divergence between the Stern Review and previous research, the reaction from the academic community to the way in which Stern went about his business has been mixed – as are academic views on the reliability of his policy conclusions.

So what are the key issues?

## **Discounting damages**

Never has a substantial policy appraisal looked so far into the future. The damages from climate change will play out over the next several hundred years (the Stern report has a

time horizon that stretches out as far as the year 2300). So even more than usual the key decision in any calculation of the 'net present value' of a particular policy profile is how you choose to discount. In other words, how you choose to trade off present versus future.

In making investment decisions in the private sector it is natural to use the market rate of interest to measure this trade-off. But in evaluating public policy 'investments' this is unlikely to be appropriate – we need to use some estimate of the 'social time preference rate' (STPR). The choice of rate is crucial: choosing a low STPR means that your evaluation places comparatively high weight on the future, and so enhances the economic case for costly action to prevent harmful climate change.

Much of the furore that has followed the publication of the Stern Review has centred around the choice of an STPR of 1.4% – a figure much lower than that typically used in policy evaluations. It is also well below the 3.5% proposed in HM Treasury's own handbook (the so-called 'Green Book') on how policy appraisal should be conducted.

This is probably the single most substantial way in which Stern overstates the damages from climate change. By how much depends upon what you think the correct (but probably higher) discount rate should be, but the very long time-horizons mean that the impact can be enormous. Harvard economist Martin Weitzman reckons that most professional economists would agree to a rate of perhaps 6%. Crunching the numbers tells us that discounting at 6% rather than Stern's rate of 1.4% reduces the present value of damages done 100 years out by a factor of 100!

So what is the correct rate? Despite the appearance of the STPR as a technical parameter to be argued over by experts, in reality it is fundamentally a statement of ethics or societal taste. So this is an area where the outcome of public – not expert – debate should be all determining.

To illustrate some of the ethics involved, consider the following. It's based on one of the Stern team's most pessimistic scenarios – think of it as the 95th most pessimistic out of 100.

Without climate change, the review forecasts that world-wide real per-capita income will grow at 1.3% per annum, so that mean per-capita income (expressed in constant 2006 US dollars) will rise from its current level of about \$8000 to \$94,000 by the

year 2200. With climate change, on the other hand, GDP by 2200 would be depressed by around 14% – implying that mean per-capita income will be about \$81,000. In other words, once the full impact of climate change (as conceived of by Stern) is taken into account, the representative individual alive in 2200 will only be 10 times (rather than 12 times) better off than someone alive today.

So the ethical question is how much we think it worth paying today to ensure that future GDP not be depressed in this way. By choosing a low discount rate, we say we should be willing to pay a lot to protect the interests of future generations (who are expected to be a lot richer than us anyway). On the other hand, a higher rate would favour more short-term efforts at development in the poorest parts of the world, thereby assisting some of the poorest alive today.

#### **Not the whole story**

But it isn't all one-way traffic. While the method chosen to discount has undoubtedly pushed up the evaluation of climate-change damage and made more urgent the case for action, there are also ways in which the Stern Review almost certainly under-estimates those costs – perhaps substantially.

Perhaps most important amongst these is its failure to get to grips with the species extinctions that worst-case climate change might imply. Scientists say that we could lose as many as 30% of species during the current century if climate change continues unabated.

Of course, attaching a meaningful economic value to such a cataclysmic loss of biodiversity will require real ingenuity. But it needs to be done, and the G8 meeting in Potsdam in March agreed to sponsor a major project that would seek to do just that. This is a real step forward for those who believe species loss should form the basis of the case for strong action to reduce climate change, and it will be intriguing to see how the work develops over the next year or two.

#### **Stern evaluation**

Stern does a real service to the climate-change debate by putting economics front and centre of the 'so what do we do about it?' part of the debate.

But the Stern Review should be seen primarily as a political document designed to sell a particular policy proposal, rather than as a dispassionate piece of economic analysis.

Reading it in fine-tooth detail did not convince at least this reader that we should jettison the established results from economic analysis in this area – which state that there is a case for climate-change policy, but one starting at a comparatively low base and 'ramping up' over the next few decades – in favour of the more immediate and substantial policy implications arrived at by Stern.

And underpinning these decisions must be ethics. Economic analysis can inform policy but not determine it. Raising net present value is (other things being equal) a good thing. But policy will also involve substantial redistribution both within generations and between generations.

It is worth bearing in mind that more than half of the growth in carbon emissions over the next 50 years is forecast to come from China and India. These remain poor countries – GDP per head in India is under US\$900 – and those of us sitting in the comfort of Western offices should think long and hard before trying to make an ethical case for any international action that might slow the rate of economic development in those countries. The robust economic development of the poor countries of Asia and sub-Saharan Africa can serve not only to reduce poverty directly, but also to increase the resilience of those economies to longer-term climate change.

And how might any of this debate affect New Zealand? The claim frequently made is that New Zealand is too small to make any difference to the global climate, and therefore it shouldn't bother. This is the classic 'free rider' argument for inaction. But a tonne of carbon emitted in Dunedin does the same global damage as a tonne emitted in Denver or Djibouti.

Making sure that we choose an appropriate path for that carbon price – high enough, but not too high – and then get enough of the world to take notice of it, is the challenge ahead. There are unlikely to be any simple answers.

**Anthony Heyes** is Professor of Economics at Royal Holloway College, University of London. From March to May 2007 he visited ISCR as the first holder of the S T Lee Research Fellowship. This article is based on public lectures Anthony gave in Auckland, Christchurch and Wellington as part of that fellowship.

# Incentives and Competition in the Ivory Tower

How to best fund universities is an ongoing, and unresolved, problem. Elizabeth Murray and Mike Webb argue that university funding in New Zealand over the last two decades has been characterised by a greater emphasis on competition – and that further pro-competition reforms are desirable.<sup>1</sup>

**B**ecause tertiary education is a service, the quality of its outputs is difficult to observe and measure: students are only able to fully evaluate the quality of their education after reflection in later life; and research quality can only be imperfectly assessed by contributions to the academic literature.

Other factors accentuate these fundamental difficulties. First, the university sector is characterised by asymmetric information – staff and managers have a far better idea of the manner in which research and teaching is undertaken than do students and funders. Second, incentives to optimise performance are diluted because universities have no effective ownership interest that focuses on the cash or social surplus delivered. Third, government ownership means that the discipline provided by a hard bankruptcy constraint is absent.

For these reasons, it is important to understand the incentives provided by any funding arrangement. Over the last two decades, funding mechanisms in New Zealand universities have taken at least three distinct forms, although the general trend has been towards more competition.

## Keeping faculty dinners going over the decades

For many years, the centralised 'university grants' system centrally allocated funding for a fixed number of students independently of any explicit performance measures. From the late 1980s this was superseded by a system in which the government provided funding in proportion to an institution's equivalent-full-time-student (EFTS) numbers. Universities were also given the discretion to charge additional tuition fees – although after 2000 a cap was placed on increases in these fees.

Since 2004, the EFTS system has been complemented (and its importance reduced) by the Performance-Based Research Fund (PBRF)



scheme, under which universities and other tertiary education providers compete for a share of government research funding. Competition is based on research-performance 'rankings': explicit indicators of performance include individual researchers' research quality, postgraduate-degree completion rates, and quantity of external research funding.

## Competition and incentives

Under the 'university grants' system, there was little competition amongst universities and no incentive to improve performance in order to attract more funding. By contrast, the EFTS system made 'competition for students' into a way of raising revenue, which should have given universities a clear incentive to focus on teaching quality. Unfortunately, it usually had the opposite effect. Institutions concentrated on maximising 'bums on seats' (which was often achieved at the expense of quality, because of asymmetric information) and there was a proliferation of low-quality courses. In addition, tertiary institutions had little incentive to cooperate with each other – which had potential for a wasteful duplication of courses.

The PBRF system reallocates some funding away from 'bums on seats' to research performance. So it reduces direct competition for students. But it simultaneously increases indirect competition: the public nature of the rankings is likely to be used by students in choosing a university, thereby providing an additional incentive for better research

performance. Whereas research competition amongst universities was previously motivated only by a desire for 'bragging rights', there are now direct financial implications. Consequently, the system bolsters the incentive to produce high-quality research.

Of course, the PBRF may also provide an incentive for institutions to emphasise research at the expense of teaching.<sup>2</sup> One way of overcoming this is simply to extend the PBRF to teaching and learning, but this is unlikely: evaluation of teaching and learning would be much more difficult than for research. In any event, universities still compete for students via the EFTS system – so any switch towards research is, in all likelihood, an overdue reaction to a previous over-emphasis on teaching activities (at the expense of research).

## The bottom line

Post-PBRF competition provides universities with a strong incentive to provide quality in a cost-effective manner and to focus on areas in which they have a comparative advantage. The incentive to maximise teaching quality, however, is sharpest when students are able to make an undistorted choice about which programme of study to follow. Currently this objective is hindered by the post-2000 cap on tuition-fee growth – a restriction that may well hurt students in the long run.

<sup>1</sup> This article is partly based on: L Evans and N Quigley. 2006. 'The Performance-Based Research Fund and the benefits of competition between universities' in L Bakker, J Boston, L Campbell and R Smyth (eds) *Evaluating the Performance-Based Research Fund: Framing the Debate*. Institute for Policy Studies. Wellington.

<sup>2</sup> This is what economists call a 'multi-tasking' effect. See: C Prendergast. 1999. 'The provision of incentives in firms' *Journal of Economic Literature* 37 pp7-63.

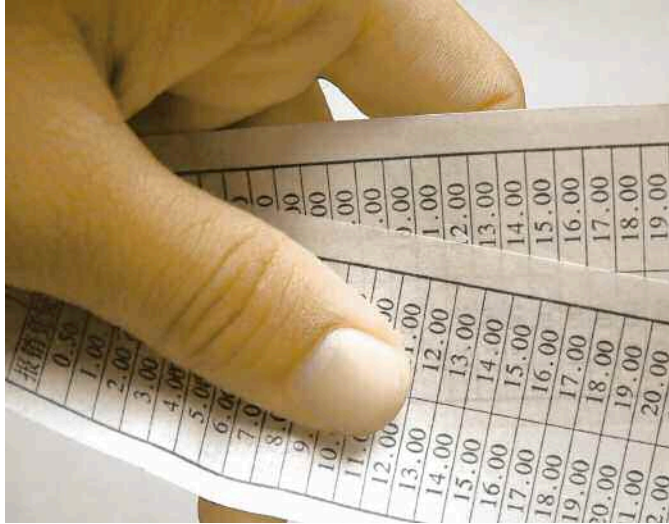
Elizabeth Murray and Mike Webb were research assistants at ISCR during 2006.



# does substitute trading make insider-trading regulation ineffective?

Insider-trading regulation is intended to prevent a firm's insiders from using superior information to obtain excess profits at the expense of outside shareholders. But information advantages can be exploited in other ways, such as by trading in the securities of related firms. Consequently, as Hui Huang explains, the regulation of insider trading can have perverse consequences.<sup>1</sup>

**T**he pros and cons of insider-trading regulation are controversial. Proponents of regulation argue that insider trading reduces market confidence and hence firm value, that it drives a wedge between market prices and fundamental values, and that it increases both the costs of trading and market volatility. By contrast, others would maintain that insider trading facilitates the incorporation of information into prices, and helps reduce the conflict of interest between managers and shareholders. Most countries – including New Zealand – have eventually been persuaded by the first set of arguments and hence have imposed strict restrictions on insider trading.



## An off-course substitute

However, in at least some jurisdictions, insider-trading regulations do not prohibit trade in the securities of related firms (such as competitors, suppliers, and customers).<sup>2</sup> This raises the possibility that insiders possessing non-public information about their own firm could legally profit from that information if it also has relevance for related firms – so-called 'substitute trading'.

What implications does substitute trading have for the effectiveness of insider-trading regulation? At first glance, it would seem to undermine the intention of the regulations by allowing insiders to maintain excess trading profits. Is this view too simplistic?

## But is it a winner?

The answer depends on whether the underlying market trading mechanism is opaque (a market maker in a firm's shares observes the order flow of those shares only) or transparent (the market maker also observes the order flows of the shares of related firms).

Consider first an opaque trading environment. If insider trading is not regulated, then

insiders will trade in both own- and related-firm securities in the direction indicated by their information (that is, they buy on positive information and sell on negative). If insider trading is regulated, however, insiders can only trade in related-firm securities. Now suppose that inside information is own-firm specific (that is, it has relatively little relevance for related firms). In this case insider-trading restrictions clearly reduce the profits available to insiders, since they are unable to use their information where it is most profitable. But if the information is equally relevant to related firms, then the regulations could actually increase the aggregate profits available to insiders. The reason is simple: when firms are closely related, insiders will compete against each other on the basis of what is almost the same piece of information. That is, provided there are no restrictions on trading. With restrictions in place, however, this competition is reduced (since each insider cannot trade own-firm stock) and greater profits are available. In the simplest case where there are just two firms, insider trading regulations cause each firm's insider to become an information monopolist in the other firm's stock, allowing both to make greater profits than if there were no such regulations.

Now consider a transparent environment. If insider trading is regulated, only substitute

trading occurs. If insider trading is not regulated, then insiders will certainly trade their own stocks in the direction indicated by their information. However, trading in the stock of other firms may reveal their information to the market maker, who will then take actions that limit further profits to insiders. As a result, some insiders will find it optimal to 'muddy the waters' by trading the stock of related firms<sup>3</sup> against the direction indicated by their information, thereby creating greater potential for profit from trading their own firm's stock.

Although such a strategy can be costly, attempting to deceive the market maker in this way nevertheless leaves insiders with greater aggregate profits than if insider trading were prohibited and they were unable to trade their own securities. In a transparent environment, insider profits are always reduced by regulation – even when there is substitute trading.

What all this suggests is that insider-trading regulation cannot be imposed, or considered, in isolation. Its effectiveness in achieving its intended goals depends on the transparency of the market trading mechanism. Markets need to know not only the information insiders have about their own firms, but also the implications of this information for other firms.

1 This article is based on: H Huang. 2005. *Substitute trading and the effectiveness of insider trading regulations* (available at <http://ssrn.com/abstract=829425>).

2 I Ayres and J Bankman. 2001. 'Substitutes for Insider Trading' *Stanford Law Review* 54 pp235-94.

3 This is particularly true when the related firm offers low potential for profit – for example, a firm that attracts little interest from small investors, or one that has low levels of uncertainty about its value.

**Hui Huang** is a lecturer in the School of Economics and Finance at Victoria University of Wellington.

# managing the risk of power shortfalls: A Case of Chasing One's Tail



Electricity retailers sometimes find themselves in the situation where consumer demand exceeds their ability to supply. One possible response to this shortfall is to buy power on the spot market, but this is risky because of the volatile nature of spot prices. An alternative option is to hedge using financial derivatives. Thomas Noe outlines the complex hedging problem faced by power companies, describes the optimal strategy, and considers the feedback effect of this strategy on the underlying dynamics of the electricity spot market.<sup>1</sup>

**T**he constraints faced by regulated US utilities that provide retail power are unique. Although other businesses are often faced with price caps and regulated prices, most are not forced to sell at the regulated price – they are simply prohibited from selling at a higher price. The petrol station owner, after the imposition of a price cap, can always just sell his supply and then close early for the day. Moreover, price caps in other industries are usually accompanied by some mechanism to ration consumer demand, such as ration books or coupons.

What makes the electricity problem particularly vexing for executives (but interesting for researchers) is that utilities must sell unlimited quantities at a fixed price to their retail consumers. These consumers never know, much less pay, the marginal cost of the product they are consuming. Regulatory price adjustments should, in the long run, reflect the

costs of meeting unrestricted consumer demand. In the short run, however, utilities have limited credit and liquid assets, are faced with inflexible supply capacity, and must satisfy large surges in consumer demand that can be accompanied by large swings in the spot price of power.

When facing these constraints, what hedging strategy should an electricity retailer follow? In general, a utility wants to have enough cash to buy power whenever a shortfall occurs, so it needs a hedge that provides high cash-inflows in these circumstances. Clearly, this need is particularly acute in shortfalls where power prices are high as well, suggesting the use of a hedge that offers payouts which increase with power prices (such as power-price contingent derivatives). However, simply hedging one's price risk is not an efficient strategy – for the obvious reason that the price of power may be high

when customer demand is low and so the utility is not in need of additional power beyond its baseload capacity. Hedging this sort of 'risk' is unnecessary and wasteful. Consequently, a good hedge also tracks the quantity of power demanded by consumers. In practice, such tracking could be achieved via the purchase of weather derivatives.

## **Meatball hedging**

While both demand and price matching are essential components of a good hedge, the optimal hedging strategy also contains a third, and more subtle, element – the 'triage' principle. High power prices imply that the price of covering each unit of consumer power demand is very high. Thus, given a fixed financial capacity of the utility to hedge, triage hedging policies (which ignore funding worst-case situations) are sometimes best for minimising expected brownouts. The idea is

that by concentrating hedging activities on recoverable situations and not wasting resources on 'hopeless' cases, a utility can attain a lower overall probability of brownout.

A simple example illustrates this point. Suppose a utility expects 400MWh of excess demand when spot prices are \$300/MWh and when spot prices are \$600/MWh. The firm thinks that the two prices are equally likely and has \$120,000 available for hedging. Two electricity options exist for this purpose: a call on the power spot price with a strike price of \$200 (the '200-call') and a call on the power spot price with a strike price of \$300 (the '300-call'). The current market price of the 200-calls is \$250, while that of the 300-calls is \$150. If the firm wants to use these derivatives to fund consumer demand at all spot price levels, it will just buy 200-calls. Specifically, given this call's price and the utility's hedging capacity, 480 200-calls will be bought. Each call will pay out \$100 and \$400 when the spot price is \$300 and \$600 respectively. The resulting proceeds will fund the purchase of 160MWh when prices are \$300 (that is:  $(480 \times \$100) \div \$300$ ) and 320MWh when prices are \$600. By contrast, when the firm follows a triage strategy, which maximises power purchases when the spot price is relatively low (in other words, when the situation is not too dire), the firm can cover more consumer demand. For example, the firm could use the available \$120,000 to buy 1200 200-calls and simultaneously short 1200 300-calls – then its cash inflow when the price is \$300 (equal to \$120,000) is sufficient to buy enough spot power to cover all 400MWh of consumer excess demand in that state, while its cash inflow when the price is \$600 (also \$120,000) is sufficient to buy 200MWh in that state.

How do these two strategies compare? The simple power call strategy produces a 60% brownout when the spot price is \$300 and a 20% brownout when the price is \$600, yielding an overall brownout probability of 40%. The triage strategy produces no brownouts when prices equal \$300 and a 50% brownout when the power price is \$600, resulting in only a 25% overall brownout probability. Clearly, it pays to devote hedging resources to situations where they can do the most good.

Thus, a utility's best hedging portfolio will not be either a simple demand hedge with weather derivatives or a simple price hedge with power options. Instead, it will target hedge payouts towards shortfall states where

those payouts can have a significant effect on the scale of the shortfall; it will not always attempt to make hedge payouts highest when power prices are highest. There is a basic tension between the triage principle illustrated above and the fact that more money is needed to fund power purchases when power prices are high. For these reasons, the optimal hedging strategy for an individual utility is a mixture of price and quantity hedging, with the hedge's payoff likely to first rise, but subsequently fall, with the level of spot power prices.

## **The fixed-price contracts offered to retail customers in New Zealand mean that local electricity suppliers face largely the same problem as their US counterparts.**

### **Price volatility begets hedging ...**

### **... and hedging begets price volatility**

Using the principles above, each utility will tailor its hedging policy to its specific consumer demand structure, capitalisation, and liquidity. Each may well assume that the merchant price of power and the prices of financial hedging instruments will not be affected by its own hedging decisions. However, aggregate hedging decisions can have a very significant impact on the spot market for power. The reason is simple: derivatives allow the utility to shape its future cash flows so that it has a lot of liquidity when it needs it most – that is, when it must buy spot power to avoid browning out. But this cash has no effect on the short-run supply of power, which is fixed. Thus, because of financial derivatives markets, utilities end up with a lot of money to buy spot power at the exact time when power is in very short supply. This

liquidity-induced demand amplifies price shocks and generally leads to higher spot prices and greater volatility in the spot market for power.

Is greater spot-price volatility good or bad? Certainly for the manager who has to manage the firm's production and hedging plans, volatility is problematic – and so hedging contributes to the problems it is designed to alleviate. But from the point of view of society at large, the question is more difficult to answer. On the one hand, derivatives markets allow the utility to better mobilise its financial resources in order to target situations where consumer demand is high. On the other hand, because consumer demands are based on regulated prices that do not reflect the true marginal costs of power, mobilising resources to meet these demands may not be very efficient. To put it another way: if merchant power prices, which do reflect true marginal costs, are close to regulated prices, then hedges that ensure the utility can fund power purchases to meet a surge in demand (or an unexpected outage) are efficient and improve the welfare of society. However, marshalling liquidity to buy \$1000MWh power for consumers who by their demands have only shown a willingness to pay \$10MWh (as occurred in the US Midwest crises of the 1990s) is unlikely to be welfare-enhancing – in all likelihood, consumers would prefer brownouts to paying true marginal costs.

Although retail prices are not regulated in New Zealand, the fixed-price contracts offered to retail customers mean that local electricity suppliers face largely the same problem as their US counterparts: they are required to meet fluctuating consumer demand while being confronted with volatile spot prices and fixed supply capacity. In these circumstances, triage hedging is likely to be a valuable financial tool for New Zealand retailers – albeit at the cost of greater spot-price volatility.

<sup>1</sup> This article is based on: S Banerjee and T Noe. 2007. 'Exotics and electrons: Electric power crises and financial risk management' *Journal of Business* 79 pp2659-2696.

**Thomas Noe** is the A B Freeman Professor of Finance at Tulane University.

# Management Shareholding ain't all it's cracked up to be

Stock- and option-based compensation is generally given to managers for the purpose of aligning their incentives with those of shareholders. But, as William Taylor points out, it may actually have the opposite effect: managers become over-exposed to their firm's fortunes and so make more conservative investment decisions than shareholders would like.<sup>1</sup>

Standard finance theory contains at its core a simple proposition: because investors can eliminate firm-specific risk through the holding of diversified asset portfolios, the only risk that is relevant when evaluating a project is its 'systematic' or 'market' risk. This leads directly to the observation that a project's hurdle rate (its required return) is its WACC (weighted-average-cost-of-capital). However, even if such a policy is in the best interests of shareholders, it is by no means clear that it is also in the best interests of the managers who actually make investment decisions. After all, managers who receive remuneration in the form of (non-tradable) stocks and options may as a result hold undiversified portfolios, resulting in over-exposure to the risk of the firm in which they are employed. Consequently, their perspective differs from that of the investor assumed by the standard theory.

## Give a dog a bone

If the manager of a firm is undiversified, does it affect the investment decisions made on behalf of shareholders? Yes, it does – and significantly.

Assuming that the manager maximises expected lifetime utility, the dashed lines in the graph opposite this paragraph show a project's optimal (from the manager's perspective) hurdle rate ( $h$ ) as a function of the proportion of the firm owned by the manager through stock and option grants ( $\alpha$ ). Each dashed line corresponds to a different managerial-wealth level. Finally, the solid line depicts the project's WACC.

Three things are apparent from this graph. First, unless they are independently wealthy ('rich') and they don't own too much of the firm, managers adopt a hurdle rate that exceeds WACC. The reason is simple: the inability to trade stock and options grants makes managerial wealth dependent on the fortunes of the employing firm, and so

managers adopt a safety-first approach that screens out projects of marginal profitability (but which would nevertheless add to shareholder wealth). Thus there is an 'under-investment' problem – managers generally invest in fewer projects than shareholders would like. Second, 'poor' managers (those who are not independently wealthy) choose a higher hurdle rate than 'rich' managers because firm ownership has a greater impact on the diversification of their portfolio, and thus they care more about the firm's specific risk. Third, for similar reasons, the hurdle rate chosen by 'poor' managers is much more sensitive to their ownership share.

The impact of under-diversification on investment decisionmaking can be severe: even a tiny amount of firm ownership can approximately double the hurdle rate adopted by a manager with little wealth.

So, what are the implications of all this for executive compensation?

## Some dogs are hungrier than others

It's commonly argued that remunerating managers with stock and options grants will make them 'think like shareholders' (since

they are entitled to a share of profits), and hence run the company in a manner desired by shareholders. However, this overlooks the fact that such grants paradoxically create a conflict-of-interest problem: managers use a higher hurdle rate than is optimal for shareholders and hence pass up investment projects that would enhance shareholder wealth.

In designing managerial remuneration policy, shareholders must therefore trade off the benefits of incentive alignment with the conflict-of-interest cost caused by over-exposing the manager to the firm. Given that the latter is larger for 'poorer' managers, it may be unproductive to provide them with ownership incentives because of the adverse effect that this is likely to have on their portfolio diversification. On the other hand, this cost is more minor for wealthier managers, enhancing the case for equity-based compensation.

<sup>1</sup> For an analysis of the effect of manager under-diversification on decisions they make on their own behalf, see 'Valuing ESOs is not that simple' *Competition and Regulation Times* issue 22 March 2007 p10.

William Taylor is a Masters degree student at ISCR. This article is based on his thesis.

