

Do Australian woolgrowers manage price risk rationally?

Paul Deane¹ and B Malcolm²

¹ Woolmark Market Intelligence, Australian Wool Services, GPO Box 4867, Melbourne, VIC 3001 Australia

²The University of Melbourne, Parkville VIC 3010 Australia

bmalcolm@unimelb.edu.au

Contents

Introduction
 Price risk and hedging
 Business risk
 Financial risk
 Interaction between business risk and financial risk
 Conclusions
 References

Abstract. Australian woolgrowers have not adopted price risk management in the last decade. This is despite a concerted effort at various times by participants in the wool industry to encourage growers to use hedging/forward selling. The explanation for the reluctance of woolgrowers to use futures market and forward pricing instruments lies not in market failure but in characteristics of wool producing farm businesses. In particular, the degree of business and financial risk and the interaction between the two helps to explain why woolgrowers do not use futures. In the context of the whole farm system, Australian woolgrowers are behaving as rational managers of wool price risk.

Keywords: price risk management, motivation for hedging, business risk, financial risk, Australian woolgrowers

Introduction

Price risk management is promoted to Australian woolgrowers because full wool price exposure by growers is commonly perceived as having a significant economic cost to the farm business. It follows that this 'problem' should be handled by woolgrowers using futures instruments to hedge against price risk.

The Garnaut committee's view back in 1993 was that wool futures were, if not the hope of the side, at least going to be very important in the future (Malcolm 1994). In another instance, an ABARE report (Lubulwa *et al.* 1997, p.1) which looked at wool futures as part of a price risk management study, started by asserting that '*the management of price risk is widely acknowledged as a significant problem facing many Australian woolgrowers*'.

Renewed focus on price risk management for growers occurred in the early to mid-1990s, following the demise of the wool Reserve Price Scheme and growers being once again fully exposed to the wool price. In 1995 the Sydney Futures Exchange (SFE) introduced a deliverable greasy (21 micron) futures contract, followed by a greasy wool options contract in early 1996. Adding to this momentum, a broad (23 micron) and fine (19 micron) wool futures contracts commenced trading in 1998.

Concurrent to this, the Australian based merchant bank Macquarie Bank, had

introduced over-the-counter wool futures in 1994. Ultimately, Macquarie Bank offered over-the-counter price risk management tools based on 18 to 25 micron fleece wool (one micron intervals), and even implemented a crossbred futures (28 micron) product. A decade after Macquarie Bank had begun offering price risk management to the wool industry, Macquarie quit from wool futures and options.

Over this period, the Macquarie Bank and the Sydney Futures Exchange wool futures markets helped facilitate agribusinesses (brokers, banks, exporters, etc.) to develop and market 'retail' price risk management products to woolgrowers. Coinciding with this renewed focus on price risk management was also a notable push to educate growers on the benefits and available tools.

Despite these developments, woolgrowers in Australia have made little use of hedging to manage price risk. Around 10 per cent of the annual wool clip is sold using forward contracts or with some other form of price protection, with 85 to 90 per cent of wool continuing to be sold at auction each year.

According to ABARE (2006), the top 25 per cent (financial performance) of wool producers subject 8 per cent of the clip to price risk management, while for the remaining 75 per cent of farms, only 4 per cent of their clip is subject to price risk management. Lubulwa *et al.* (1997) found

around 2-3 per cent of woolgrowers used futures.

The reasons farmers do or do not use futures market instruments has been studied often in the United States, and less in Australia. Ada *et al.* (2006) and Simmons (2002) are examples. The US work has identified that the use of forward pricing instruments by farmers is related to education, experience, farm leverage, farm size, off-farm income, expected income change from hedging and the belief that hedging could stabilize income (Shapiro and Brorsen 1988). Apsluns *et al.* (1989) found age, attendance at seminars, use of computerized information, farm size, farm leverage, and participation in government commodity programs influenced use of price risk management tools.

Isengildina and Hudson (2001) found that use of hedging by cotton producers was affected by farm size and leverage – larger farms and higher leverage led to more use of futures. It was affected negatively by marketing training, belief in the benefits of pools and personal marketing preferences.

Vergara *et al.* (2004) found that choice of marketing techniques by cotton producers was affected by the number of acres, which positively influenced pooling and negatively influenced use of cash sales. Cotton producers prepared to incur higher marketing transaction and training costs tended to choose futures and options and forward pricing. Producers keen to speculate chose pooling, while the risk averse did not.

Producers who considered that the markets were efficient preferred cash sales. Brorsen (1995) concluded that highly geared producers (i.e. high levels of borrowings) were more likely to use futures hedging due to their greater exposure to loan repayment schedules.

In Australia, Simmons (2002, p. 1-2) drew on a 'Separation Theorem' that holds that farmers can achieve optimal risk exposure if capital markets are efficient (negligible differences between borrowing and lending rates) '*entirely by adjusting leverage*' and concluded that '*if capital markets are efficient then farmers will have little interest in futures markets*'.

Ada (2006) found that nearly all cotton producers had attempted to manage price risk at some time, and 60 per cent of producers judged that price risk management had positive effects on their business. Over half the cotton producers had used futures or options.

The question is raised: Given the volatility of wool prices, why don't Australian woolgrowers adopt hedging? The central ideas of this paper are as follows:

(i) Australian woolgrowers are behaving as rational managers of risk in typically not hedging.

(ii) The main reasons for not hedging their wool clip are to do with the firm's characteristics, most importantly, the extent of business and financial risk the firm faces and the interaction between the two.

(iii) While other factors can be important in explaining hedging behaviour, these are unlikely to be the main reason woolgrowers have failed to take up hedging of their clip in the last decade.

(iv) With no significant market failure involved in Australian woolgrowers not hedging, there is little justification for market intervention or the spending of industry funds in this area.

Price risk and hedging

The benefits of an efficient and liquid futures market is not the question of this paper. Rather the question is: do woolgrowers behave rationally in not hedging their wool clip?

Hedging is defined as a woolgrower locking in a sale price of future production using any type of product – forward agreements or contracts, fixed price contracts, futures or swaps. Wool futures are not the only mechanism for hedging. Hedging can also encompass the woolgrower insuring against the price falling below a minimum level by purchasing a put option.

A common starting position of people other than farmers when thinking about price risk management is that exposure to all price risk ought to be minimized – the view that all risk is 'bad' and should be avoided. The notion that risk creates returns and that risk produces positive outcomes, is not given the same prominence as risk that has bad outcomes.

In any consideration of risk, it is not risk *per se* that matters most, but rather it is the consequences of risk that matters most. The justification that a firm should hedge because of exposure to high price volatility of a commodity is not quite to the point. It is the consequences of volatile cash flows that matter.

It is in the inability to service debt, the higher cost of finance, or lower gearing restricting further investment and the benefits of reducing or avoiding these consequences, which is where the economic benefits of hedging are manifest. The economic merits of hedging are in changing the consequences of volatile cash flows.

If the economic benefits of hedging are expected to be low, and the firm can carry the amount of risk involved by doing less costly alternatives to hedging and can bear the consequences of what happens, it can make sense that the firm avoid the cost of hedging by bearing the risk (not hedging) and 'self insuring' over the medium term.

Sometimes firms do not hedge because they want the exposure to the commodity price. Australian farmers may seek exposure to commodity prices. Growers may consider that they have an inherent understanding of price cycles and the distribution of prices over the medium term and the importance of a 'perfect storm' (high yields and prices) once or twice out of every 10 years to their ability to stay in the game. As Kingwell (2000, p. 11) put it: *'storable commodities are known to have price distributions that are positively skewed. In practice this means infrequent price spikes. Hence, in the lifetime of a farmer there may be only a handful of years when prices are very high. These years are unique and provide a farmer with limited but crucial opportunities for profit. How farmers respond to these can greatly affect their long term prosperity'*.

An argument put frequently concerns the similar levels of price volatility between cotton and wool. Cotton growers make considerable use of forward and futures price risk management tools. Cotton is put up as an illustration of why woolgrowers too should embrace hedging.

Simmons (2002) suggested cotton growers made considerable use of the New York Cotton Exchange for hedging in conjunction with exchange rate hedges. Ada *et al.* (2006) found that nearly all cotton producers have attempted to manage price risk at some time, using a range of management strategies.

In a study by Woolmark (2004) it was reported that for the period 1991 to 2004, wool prices in Australian dollar terms had a coefficient of variation of 21 per cent. Over the same period volatility in cotton prices in US dollar terms were 23 per cent and 16 per cent in Australian dollars. Woolmark (2004, p.8) concluded that *'for wool these risk management tools are used much less than in cotton and other commodities. Around 85 per cent of Australia's wool is sold at auction, with only a small proportion of this hedged by futures contract. In comparison, most cotton is sold by growers on long-term contracts ... The lack of extensive use of sophisticated risk management tools in the wool industry exposes all involved, including wool producers and processors, to significant risk and volatility of income'*.

Kingwell (2000) proposed that because less than a fifth of Australian farms generated annual farm cash incomes of more than \$100,000 and were in a reasonably sound equity position, many producers saw little merit in expenditure on price risk management. Farms with large cash incomes and/or large cash expenditures were more likely to engage in price risk management.

Increased overall risk exposure makes it likely that a larger proportion of Australian cotton producers will use futures contracts in their price risk management strategies, relative to Australian wheat and wool producers. Australian cotton producers have, on average, significantly lower equity (75 per cent business equity ratio) than wheat and wool producers (85 per cent and 90 per cent respectively).

Business risk

Hedging of price risk by Australian woolgrowers reduces one of the components of business risk. In isolation, an analysis of the price volatility of wool prices indicates that woolgrowers face a potentially highly variable cash flow each year. There have been times where woolgrowers have been dealt annual price trading ranges of 30 per cent, and in extreme years as much as 50 per cent. However, this information in isolation, fails to take account of the impact of portfolios of activities and investments, which can significantly reduce the overall business risk an Australian grazing enterprise faces.

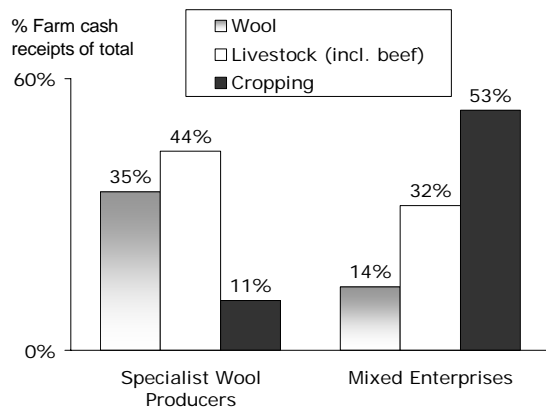
Specialist wool producers derive the majority of their income from sheep and wool production; generally more than 70 per cent of total income comes from wool and sheep sales. Mixed enterprise wool producers derive a smaller proportion of their annual income from sheep and wool. Most nowadays have significant and growing off farm sources of income too.

ABARE (2006) surveys of specialist wool producers and mixed enterprise wool producers show that around 60 per cent of Australian wool production is produced from mixed enterprise farms where annual wool sales generate 10-20 per cent per cent of total revenue. Crop receipts for mixed enterprise wool producers produce 50-60 per cent of total income.

In the last decade, wool income as a proportion of total farm income for wool producers has become less significant as income from lamb sales has increased in importance. For example, in 1992, only 30 per cent of wool producers sold lambs for slaughter. But by 2002 this proportion had

risen to 47 per cent and the relative contribution of lamb sales to total farm revenue was higher (ABARE 2003).

Chart 1. Revenue mix for wool producing farms in 2004/05



Source: ABARE 2006.

If a 'mixed farming' firm producing crops and wool, or even a woolgrowing operation that is also producing prime lambs, was to hedge to protect income flows, it would focus on price risk management on those commodities that represent a large proportion of income and expenditures. That is, the focus would be on getting the big decisions right, which for mixed enterprise wool producers will typically mean the focus on price risk management within the business will be on grains rather than wool.

Further, the focus for hedging would likely be on the activity where the threat to stability of net cash flow, or net income, is greatest. This is where an activity has a low margin of income over input costs. In this situation, relatively small price falls could cause expenditures to exceed income.

The absolute magnitude of variable costs that has to be covered by a fluctuating income is also a consideration. Cropping has higher variable costs per hectare that income has to cover than does wool production. A fluctuating crop income is likely to cause larger financial losses in the cropping activity than the loss a fluctuating wool income will cause for the wool growing activity.

It is misleading to look at price risk of one commodity that a farm produces in isolation. This is akin to a financial advisor focusing on the risk of one share without any regard to the remaining portfolio of shares/investments an entity owns. The concept of looking at risk and return in regard to a portfolio (total wealth) was first published by Markowitz (1952) over 50 years ago. Chart 1 offers a context for this type of analysis and supports the statements of the following paragraphs.

The basic premise is that most investors want higher rather than lower returns, and prefer

lower risk to higher risk. Markowitz (1952) showed that different assets can be combined to produce an 'efficient' portfolio that will give the highest level of portfolio return for any given level of portfolio risk, with risk measured by the variance or standard deviation. Modern Portfolio Theory holds that a portfolio of securities is entirely different from holdings considered individually. The concept of diversification in investing is described by Bernstein (1998, p. 253): *'while the return on a diversified portfolio will be equal to the average of the rates of return on its individual holdings, its volatility will be less than the average volatility of its individual holdings. This means that diversification is a kind of free lunch at which you can combine a group of risky securities with high expected returns into a relatively low-risk portfolio, so long as you minimise the covariances, or correlations, among the returns of individual securities'*.

The correlation of wool prices to prices of some of the other enterprises available to Australian woolgrowers where on-farm diversification is an option is an important component in judging the overall price risk faced. Kingwell (2000) found that wool and wheat on balance have offsetting price movements and that a portfolio of enterprises with offsetting price movements will lessen the overall price risk faced by the Australian farm business.

Table 1. Correlation matrix for de-trended real Australian prices from 1984 to 1997

	Wheat	Canola	Lamb
Wool	-0.32	-0.19	-0.23

Source: Kingwell 2000.

Over 60 per cent of wool growing farms are mixed enterprise businesses with diversification into enterprises such as broadacre cropping, lamb and beef. Considering the price correlations listed in Table 1 above, the overall risk created by price risk of a mixed business portfolio will be less than indicated by the volatility of any one price.

Diversification on the farm such as mixed enterprises and exposure to different commodity classes, along with other income diversification such as off-farm income and farm management deposits, all help create a hedge against volatility of business net cash flows.

Hedges against income volatility deriving from diversification of an investment portfolio can play a similar role in their outcome to 'revenue insurance' and reduce the optimal hedge ratio (Harwood *et al.* 1999). Diversification of business cash inflows from

on the farm and off the farm, and holding some stock of liquid assets, is one significant way a business can reduce the variance of cash flow and the impact of volatile cash flows.

The argument is that reducing price risks via hedging is not likely to be the main tool of financial management for woolgrowers. In practice, woolgrowers take many different steps to place their business in an overall 'risk situation' that is satisfactory to them.

Financial risk

Financial risk is a major factor in explaining hedging behaviour. The key measure of financial risk is the degree of leverage or level of gearing a firm employs. Studies of US agriculture that have focused on hedging and its relationship to the gearing ratio of a farm business have concluded that hedging tends to increase as the farm's debt to equity level increases (Harwood *et al.* 1999).

This phenomenon of hedging activity being influenced by debt levels is not confined to agricultural businesses and can be found in many types of businesses facing price risk. Haushalter (2000) examined the risk management activities of 100 oil and gas producers from 1992 to 1994. The evidence from this analysis showed that the extent of hedging was related to financing costs and that firms with greater financial leverage manage price risks more extensively.

Collins (1997) explains the differences in the hedging behaviour of firms as being caused by differences in costs and financial structure across firms. Collins (1997) argues that hedging price risk should not be conceptualised as being about reducing income variability, but rather as one of avoiding financial failure.

Perhaps the best way to illustrate the influence financial risk has on the decision-making of entrepreneurs is to highlight the differences between wool, grain and cotton growers. Australian cotton growers have the highest rate of using price risk management methods of all agricultural industries in Australia (Ada *et al.* 2006).

Kingwell (2000, p. 10) used ABARE data to highlight the differences between cotton and broadacre cropping in relation to differences in the uptake of price risk management stating that *'farms with large cash incomes or large cash expenditures are more likely to see merit in investing in price risk management. In this regard it is worth contrasting the cotton and broadacre industries, because price risk management is more common in the cotton industry in Australia. In the irrigated cotton industry average cash costs per farm in 1996/1997*

were \$1.2 million and average cash income was \$691,000. By contrast in the broad acre industry in Australia average cash costs per farm in 1996/1997 were \$0.15 million and average cash income was \$45,400'.

Kingwell (2000, p.10) went on to state that *'if the 1996/97 data are indicative of the general differences between the industries then an irrigated cotton industry farm has around 4 times the annual expenditure of an average broad acre farm and over 20 times its cash income. Hence, in the cotton industry there is much more incentive to manage price risk in order to cover greater cash costs and to protect farm profit. As pointed out by one referee, cotton growers need intra-seasonal cover because of their potentially large short-term borrowings to finance a crop'.*

Cotton and, to a lesser extent, broadacre cropping have markedly different cash costs (short-term liabilities) compared to wool growing. The different business types typically face markedly different financial and business risk in a production cycle. Whereas wool production might involve \$100/ha in variable costs, and cereal production might involve \$250/ha variable costs, irrigated cotton can require \$4,000-5,000/ha in variable costs.

Woolgrowers not only have a low cash commitment to a production cycle compared to other enterprises, but also a large percentage of these variable costs are related to shearing. These costs occur late in the production cycle, meaning the wool business has relatively low cash demands for much of the production cycle. Add to this that gearing levels may be different for cotton producers with large debts that are up to 40 to 50 per cent of total assets.

ABARE (2006) data shows 'average' wool producing firms have greater than 80 per cent equity, 20 per cent debt. More highly leveraged firms have to be more concerned about meeting their financial obligations. High yield and price risk in such situations increases the likelihood of insolvency and bankruptcy.

Next, the importance of the interaction between business and financial risk is considered. This is another case of the whole being more than the sum of the parts - analysis of either business risk or financial risk alone tells only part of the story in explaining Australian woolgrowers' hedging behaviour.

Interaction between business risk and financial risk

The importance of the interaction between financial risk and business risk is two-fold.

First, firms may balance the degree of total risk between business and financial risk, such that the total risk is at the level desired by the owners. Second, and of greater significance, is that it is only through an analysis of the interaction between these two types of risk that the firm faces that the consequences and subsequent benefits of a risk reduction strategy from hedging can be determined.

Several studies have examined this interaction between price and yield (business) risk and producer behaviour with regard to financial risk, called 'risk balancing'. Gabriel and Baker (1980) developed a conceptual framework that linked production, investment, and financing decisions via a risk constraint. Their model indicated that, in the aggregate, farmers make financial adjustments leading to decreased (or increased) financial risk in response to a rise (or fall) in business risk. A principle of constant risk was deemed at work, where business-people respond to changing circumstances to maintain a relatively constant level of risk.

The notions of 'risk balancing' and 'principle of constant risk' help explain why woolgrowers are willing to accept what might superficially seem like an 'excessive' degree of business risk (price volatility). If most wool growing businesses have a low financial risk (high equity, low annual cash flow requirements, off-farm income, etc.) then the owners of these types of firms are likely to be willing to accept greater business risk than is the case for businesses with higher financial risk and higher variable costs. They may be willing to accept greater business risk to obtain a higher income.

Measures of volatility or price risk *per se* are not meaningful until they are coupled with a consequence. For a farmer, the inherent business risks they face (prices, yields) in their farming business, has the greatest meaning when it is related to the business liabilities (financial risk) and the consequences on farmer goals. Often an assumption is made about price risk management by outsiders for a business - that the business risk (price) automatically translates into a degree of financial risk and threat to farmer goals that the business would be better off insuring against.

Ultimately, business and financial risk are inextricably linked. It is the interaction between business (price and yield) risk and financial risk (debt levels including peak debt within the production cycle) that needs to be considered in determining how strong a firm's economic motivation is likely to be to hedge.

Conclusions

The answer to the question about why Australian woolgrowers have generally failed to embrace hedging is sometimes seen as being a case of the average wool growing farm manager not behaving 'rationally'. This is especially so because woolgrowers face similar price volatility for wool to that of producers of other agricultural commodities such as cotton and broadacre crops.

The opposite may be true. The decision-makers running wool producing firms may well be behaving rationally and looking at risk and return in terms of their 'portfolio' of on-farm and off-farm income sources of income and the level of financial risk they typically face.

Several of the main points of this paper are summarised below:

1. One of the keys to the debate is that measures of price risk *per se* tells us little about risk until it is coupled with consequences and the whole system perspective. For a farmer, the inherent business risks they face (prices, yields) in their farming business generally only have meaning when related to the business liabilities (financial risk).
2. It can be misleading to look at the business risk that volatile wool prices may create in isolation. The concept of looking at risk and return in regard to a portfolio of activities and investments will typically mean that the overall business risk the farm faces will be less (due to diversification of income streams both on and off farm) than the risk implied by looking at the exposure of a single commodity price.
3. For around 60 per cent of wool producers, wool sales represent on average only 10-20 per cent of total revenue while crop income from the same farms represented 50-60 per cent. The rational risk manager will focus on the cropping enterprises for price risk management given they represent a much larger proportion of cash flow and expenditure.
4. Comparison with the cotton and grains industry to justify why wool growers should be managing price risk is flawed. Cotton and to a lesser extent broadacre cropping have markedly different cash costs (short-term liabilities) compared to wool growing and as such the different businesses typically face markedly different financial risk (especially peak debt over a production year) in a production cycle. Analysing variable costs and the short-term liabilities between the different enterprises illustrates this phenomenon. The situation is even more stark when the higher degrees of leverage

between the cotton and wool industry are considered.

5. The investment of wool industry funds to enhance wool price risk management is unlikely to yield a good return. Only a limited number of wool growing firms have a sufficiently large economic motivation to hedge. It is likely that those firms that need to do so will do so.

Notwithstanding the above points, it remains true that a well-functioning wool futures market could be of significant benefit to woolgrowers, even though they may never trade a contract, by facilitating more informed and efficient pricing and operations by others in the wool chain.

References

- Australian Bureau of Agricultural and Resource Economics 2003, 'Australian Wool Industry 2003. Report on the Australian agricultural and grazing industries survey of wool producers', *ABARE Research Report 03.5*, Canberra.
- Australian Bureau of Agricultural and Resource Economics 2006, 'Financial performance of wool producing farms to 2004-05', *ABARE Research Report 06.1*, Canberra.
- Ada T, Malcolm B, and Williams J 2006, 'Price risk management in the Australian cotton industry', *Australasian Agribusiness Review* **VOLUME?** (issue?): pages?.
- Asplund NM, Forster DL, and Stoot T 1989, 'Producers use of forward contracting and hedging', *Review of Futures Markets*, 8: 24-37.
- Bernstein P 1998, *Against the Gods: The Remarkable Story of Risk*, John Wiley & Sons, Sydney.
- Brorsen BW 1995, 'Optimal hedging ratios with risk neutral producers and non-linear borrowing costs', *American Journal of Agricultural Economics*, 77: 174-181.
- Collins RA 1997, 'Toward a positive economic theory of hedging', *American Journal of Agricultural Economics*, 79: 488-499.
- Gabriel SC and Baker CB 1980, 'Concepts of business and financial risk', *American Journal of Agricultural Economics*, 62: 560-564.
- Harwood J, Heifner R, Coble K, Perry J and Somwaru A 1999, 'Managing risk in farming: concepts, research, and analysis', *U.S. Department of Agriculture, Agricultural Economic Report No. 774*, Washington.
- Haushalter DG 2000, 'Financing policy, basis risk, corporate hedging: evidence from oil and gas producers', *The Journal of Finance*, 55: 107-152.
- Isengildina O and Hudson D 2001, 'Cotton producers use of selected marketing strategies', *The Journal of Cotton Science*, 5: 206-217.
- Kingwell R 2000. 'Price risk management for Australian broad acre farmers: some observations', *Australian Agribusiness Review*, vol 8: paper 2.
- Lubulwa M, Beare S, Bui-Lan A and Foster M 1997, 'Wool futures: price risk management for Australian woolgrowers', *ABARE Research Report 97.1*, Canberra.
- Malcolm B 1994, 'Australian agricultural policy since 1992: new emphases, old imperatives', *Review of Marketing and Agricultural Economics*, 62: 143-166.
- Markowitz H 1952, 'Portfolio selection', *Journal of Finance*, 7: 77-91.
- Simmons P 2002, 'Why do farmers have so little interest in futures markets?', *Journal of Agricultural Economics*, 27: 1-6.
- Vergara O, Cobie K, Knight TO, Patrick G and Baquet A 2004, 'Cotton producers choice of marketing techniques', *Agribusiness*, 20 (4): 465-479.
- Woolmark 2004, 'A global strategic market analysis and outlook for Australian wool'. Report Prepared for Australian Wool Innovation Limited by Woolmark Business Intelligence Group, **CITY?**.