Paper prepared for the 56th Annual Conference of the Australian Agricultural and Resource Economics Society, Fremantle, WA. February 2012.

Including risk in enterprise decisions in Australia's riskiest businesses

Mick Keogh. Australian Farm Institute.

Abstract

This study uses measures of revenue volatility to make comparisons between the business environments experienced by Australian and international farm businesses, and also between Australian farm businesses and businesses in other sectors of the Australian economy. The results indicate that Australian farm business managers operate in a more volatile business environment than is the case for virtually all national agriculture sectors world-wide, and also that businesses involved in Australian agriculture experience more than twice the level of volatility on average of businesses in other sectors of the Australian economy. These findings highlight the differences between agricultural and non-agricultural businesses, and therefore the need for different approaches to business management within different sectors.

The research also examines measures of volatility for different agricultural commodities, and available evidence of changes in volatility over time. Finally, the research examines available financial data for broadacre farms in Australia, to ascertain the extent to which farm managers and their business advisors have been able to successfully manage volatility in their business decisions. Available farm survey data indicates that crop businesses have less successfully managed business risk over the past two decades than mixed enterprise farm businesses involving both livestock and crop production.

The research concludes that the evidence points to a need to develop a more sophisticated approach to farm business management in Australia which includes greater consideration of risk in comparisons of gross margins for different farm enterprises, and also includes a more systems-based approach to farm management advice so that farm business managers are able to more adequately consider the cost of volatility or risk in making management decisions.

Introduction

Risk management has always been an important aspect of operating successful farm businesses, and in broader national policy settings associated with agriculture, both in Australia and internationally. Throughout history, most government interventions in agricultural markets can be characterised as attempting to manage risk – either at the individual farm business level, or at a national level due to concerns about issues such as food security. Two of the largest existing agricultural policy programs (The Farm Bill in the USA and the Common Agricultural Policy in the EU) essentially involve policy measures to reduce farm business risks, and virtually every nation globally has some policy measures aimed at reducing or managing risks for agricultural businesses.

All business enterprises carry with them a range of risks, but the main focus of risk management analyses and policies relevant to agriculture have been on;

(a) **production risk**, which arises from the uncertainty associated with crop and livestock growth, as weather, disease, pests, and other factors affect both the quantity and quality of commodities produced, and
(b) **Price or market risk,** which arises from uncertainty about the prices producers will receive for commodities and the cost of their inputs.

There are large numbers of research reports that analyse the nature of risks faced by agricultural businesses, and the success or otherwise of policies that aim to reduce or mitigate these risks[1]. In more recent times in Australia, these have included research which aimed to disaggregate the various elements of risk faced by grain producers in Western Australia (Kingwell, 2011), and research which aimed to evaluate different strategies (including the production of multiple commodities) available to farm business managers to manage risk (Hutchins and Nordblom, 2011)

The research reported here aims to review the nature of risk faced by Australian farm businesses, with a particular focus on revenue volatility. Revenue volatility is the product of both production and market risk over a specific period. Revenue volatility is also the critical issue from the perspective of a farm business manager, in that the ability of the business to withstand and manage large changes in annual revenue will determine whether or not the business will remain viable over the longer term.

Data and methodology.

The objective of the analysis reported here is to gain a better understanding of the business volatility experienced by Australian farm managers, and to consider whether there may be options available that could assist them to better understand and manage volatility in their businesses. Volatility refers to the degree of variability of a particular measure or statistic over time, and is defined as a directionless measure of variation. (Gilbert and Morgan 2010).

[1] The OECD has recently published a series of reports on this issue which include comprehensive bibliographies. See OECD (2011) for a recent detailed review of the subject, including extensive references.

Volatility can be quantified by calculating the extent to which an actual measured statistic diverts from the value that might be anticipated, assuming a smooth long-term trend. In a sense, volatility refers to the 'unexpected' or 'unanticipated' changes experienced by a farm business. While, in the case of a farm business, both revenue and costs can vary, the main focus in this analysis will be on revenue volatility, because to a large extent farm costs are driven by management decisions (such as how much crop will be sown or livestock produced) that are made based on revenue expectations, and therefore the revenue side of a farm business is the critical one from a profitability perspective.

Volatility is generally estimated by calculating the standard deviation of the percent difference between actual and trend value of a particular statistic over time (Productivity Commission, 2005).Trend values can be estimated in a number of ways, ranging from a simple linear best fit trend line to more complex mathematical methodologies. The appropriate methodology that should be utilised to generate longer-term trend lines is a topic of considerable debate amongst statisticians. However, in comparisons of relative volatility, such as are reported here, consistency in the methodology utilised to generate trend lines is more important than the actual methodology itself.

Given the variable and obviously non-linear nature of much of the commodity price and production data used in this analysis, it was determined that a third order polynomial trend line estimated using least squares generally provided a reasonable trend estimate, and this same methodology was used as the basis for calculating all the volatility estimates reported here.

Relative volatility of annual Australian agricultural output.

A useful starting point in analysing volatility in Australian agriculture is to compare the volatility of measures of agricultural output in Australia with those of other nations. Annual agriculture output data compiled by the Food and Agriculture Organisation of the United Nations (FAO, 2011) over the period from 1961 to 2009 was utilised to develop trend output estimates for a selection of important agricultural nations, covering a range of developed and developing nations, and for which data was available. The standard deviation of the percentage variation between trend and actual output was then calculated. The results for each nation were indexed around the average, with the average set at an index value of 100. The results are shown in Table 1, based on the annual agricultural output value (constant 2004-2006 $US) and indexed volume of annual output for each nation.

Table 1. Index of volatility of national annual agricultural output by value and volume, 1961-2009. (Average volatility for 15 nations = 100)

Country	Value of output			Indexed volume of output		
	Agriculture	Crops	Livestock	Agriculture	Crops	Livestock
Argentina	135	123	151	115	107	138
Australia	**186**	**204**	**91**	**143**	**173**	**119**
Brazil	73	69	67	87	86	63
Canada	86	122	124	103	125	80
Chile	82	60	103	127	81	178
Denmark	43	90	124	63	98	57
France	74	77	32	73	76	51
India	89	66	38	69	56	45
Mexico	72	55	35	82	61	131
Netherlands	123	91	154	102	81	131
New Zealand	76	80	93	74	114	75
Poland	102	110	146	113	104	123
South Africa	98	111	100	110	132	94
USA	65	67	128	77	90	43
Uruguay	201	152	57	162	116	172

(Data sourced from FAO, 2011)

The data identifies that the volatility in the average value of Australian agricultural output has been the second highest of any of the nations included in the research over the forty year period for which data is available, and has been 86% higher than the average for all the nations included. When disaggregated into crops and livestock products, the data shows that the volatility of Australian crop production has been higher than for any other nation (either by value or by volume) over the period, and was more than 100% higher than the average for all other nations. In contrast, the volatility of Australian livestock production has been close to or below the average of all other nations over the same period.

These results assist in putting the issue of risk in perspective for Australian farm business managers. They highlight that, by international agricultural standards, Australian farm businesses have faced a more volatile operating environment than has been the case for farmers in almost all other nations over the last forty years. It is also relevant to note that farmers in many of the other developed nations continue to receive either direct government subsidies, indirect subsidies through biofuel mandates, or payments for environmental services or land retirement that are aimed at moderating revenue volatility and hence risk for farm businesses. With the exception of drought support, such measures have not been adopted in Australia.

Relative volatility of Australian economic sectors.

Australian farm businesses compete with businesses in other sectors of the Australian economy for capital, and human and natural resources, therefore it is useful to consider the volatility of the agriculture sector relative to those other sectors of the economy, and also to identify whether the relative volatility of the agriculture sector has changed over time.

In order to compare the relative volatility of different sectors of the Australian economy, annual industry gross value added statistics compiled by the Australian Bureau of Statics (ABS 2011)

for the period from 1975 to 2011 were obtained for seventeen sectors of the Australian economy. Trend estimates were derived for annual industry output for each sector, and the percentage variability of actual industry output relative to trend was then calculated, in the same manner as described above. The results were calculated for the entire thirty-seven years for which data was available, and also on a decade-by-decade basis in order to obtain some perspective of relative changes in volatility for each industry sector over time. The results of this analysis are shown in Table 2.

Table 2. Index of relative volatility in annual value of output for major Australian economic sectors.

Industry sector	Whole period 1975-2011	1975-84	1985-94	1995-04	2004-11
Health care	46	56	48	34	29
Electricity, gas and waste	47	59	35	31	60
Public administration	49	53	51	50	45
Education and training	54	75	43	27	42
Transport	72	90	72	45	83
Rental and real estate services	73	64	88	77	102
Manufacturing	75	79	91	63	76
Retail trade	75	62	95	59	107
Professional services	97	67	132	116	83
Accommodation and food services	103	85	118	112	150
Administrative services	115	122	104	161	111
Wholesale trade	120	106	172	76	65
IT, Media and telecommunications	120	167	53	64	65
Mining	128	159	108	124	122
Construction	134	94	162	200	116
Finance and insurance	157	106	208	87	153
Agriculture	**234**	**257**	**120**	**374**	**293**
All industry average	100	100	100	100	100

(Data sourced from ABS, 2011)

The results in the table indicates that the agriculture industry has been, and remains the most volatile sector of the Australian economy over the past four decades, and that the value of output from the agriculture sector has been almost two and a half times more volatile than the average for all the major sectors the economy. This result is similar to that reported by the Productivity Commission (PC, 2005), although the Productivity Commission analysis did not include data later than the 2003-04 year.

The above results also indicates that the agriculture sector may have become relatively more volatile over the most recent two decades, a result that is not surprising given the extended drought experienced in southern Australia over the period from 2002 – 2009, which significantly reduced agricultural output over that period. In addition to climatic variations, agricultural commodity prices have also fluctuated significantly, adding to farm business volatility.

Relative volatility of Australian agricultural commodity sub-sectors.

Within the Australian farm sector, there are a range of different commodity sub-sectors, each of which experiences differing levels of volatility in both commodity prices and production volumes. The volatility of the total annual value of production of a specific commodity is a combination of both seasonal conditions (affecting production intentions, crop yields and livestock growth rates) and commodity prices (affecting production intentions and revenue), with commodity prices affected by a range of domestic and international market factors, depending on the commodity involved. Volatility of production also varies depending on regional location, with some regions being 'safer' and some less so in terms of seasonal rainfall and temperature expectations.

In order to compare volatility between commodity sub-sectors, the annual value of output from each of the main commodity sub-sectors was obtained for the period from 1961 through to 2009. Trend estimates were calculated for each commodity, and the volatility of each was then calculated using the same methodology as that outlined above. The relative volatility of each commodity sub-sector was then indexed for the entire period, and for each of the decades over the period under examination.

Table 3. Index of relative volatility in annual value of output for major Australian agricultural commodity sub-sectors.

Commodity sub-sector	Whole period	1961-70	1971-80	1981-90	1991-00	2001-09
Fruit and nuts	57	61	66	32	40	79
Vegetables	62	91	64	67	41	56
Grains and oilseeds	195	190	149	303	255	286
Dairy	103	107	90	40	113	130
Beef	128	119	164	94	58	51
Sheepmeats	108	68	181	87	56	101
Pork	78	69	123	43	29	73
Poultry	60	111	31	32	50	27
Wool	101	82	87	216	131	84
Sugar	109	103	45	86	227	112
All commodity average	100	100	100	100	100	100

(Data sourced from FAO and ABS)

Some of the above results are expected, given developments that have occurred in each of the commodity sub-sectors over the period in question. The beef industry, for example, experienced a very turbulent period during the 1970's when cattle prices slumped and became virtually worthless, resulting in an exodus from the industry. The wool industry also experienced considerable turmoil during the late 1980s and early 1990s as sheep numbers increased dramatically due to high prices in the second half of the 1980s, and then declined due to the price crash associated with the cessation of the reserve price scheme in early 1991.

While recognising that these effects distort results for specific commodities, there are a number of generalizations that can be made arising from the results displayed in this table. Firstly, the horticulture sub-sectors have experienced considerably less volatility than the broadacre sub-sectors such as grains, beef and sheepmeats. This is to be anticipated, as fruit and vegetable

production normally occurs under irrigation, therefore reducing production variation due to seasonal conditions. Fruit and nut production also involves a relatively fixed stock of trees that cannot quickly be adjusted given changes in commodity prices. As would also be expected, the intensive livestock sub-sectors (pork and poultry) have also experienced considerably less volatility that the broadacre sub-sectors, again because these sub-sectors are largely unaffected by seasonal conditions.

What is also quite evident is that the grains and oilseed sub-sectors have consistently experienced a much higher level of volatility than any other sub-sector of agriculture. This is as would be expected given that non-irrigated grains and oilseed production in particular can be very significantly affected by adverse seasonal conditions such as low or untimely rainfall. Grain and oilseed production also involves annual decisions by farmers about crop varieties and areas, which means farmers can respond quickly depending on prevailing prices and seasonal conditions. Broadacre livestock production, on the other hand, generally involves longer-term decision-making, and livestock are often retained for some time despite poor seasonal conditions, and can be maintained during droughts by utilising supplementary feed.

The extent to which volatility in a particular commodity sub-sector is a consequence of decisions by farmers, or is an intrinsic feature of the production system and associated markets is difficult to determine. Recent research by Kingwell (Kingwell, 2011) addressed this question in an analysis of the volatility of wheat revenue for Australian farmers over the last fifteen years. That analysis separated out the various components of revenue variance for wheat production (price volatility, wheat area planted and wheat yields) and concluded that the de-trended volatility of wheat revenue has more than doubled in every main wheat-growing state of Australia over the last fifteen years. That research identified changes in the area of wheat sown (a management decision made by farmers in response to prevailing seasons and prices) was mostly a minor source of revenue variance. It was found that the major sources of revenue volatility were yield variance (associated with seasonal conditions) and that while less important, price changes have also increased in importance as a source of revenue volatility over the period in question.

The data displayed in Table 3 appears to confirm these findings, with the volatility of the total value of production of the "Grains and Oilseeds" sub-sector increasing substantially over recent decades, especially relative to other commodity sub-sectors.

Relative volatility of Australian agricultural commodity prices.

As noted above, the volatility of agricultural commodity prices is likely to be an important component of the overall revenue volatility experienced by Australian farm businesses. The volatility of global agricultural commodity prices has been the subject of a number of research studies over recent years (Gilbert and Morgan 2010, Winsen et. al. 2011, Poon and Weersink 2011, Kimura and Anton 2011, Kimura, Anton and LeThi 2010, FAO et. al. 2011, High Level Panel of Experts 2011). Many of these analyses conclude that agricultural commodity prices are more volatile over recent years than they were during the 1990s and early 2000s, but not more volatile that they were during the 1970s.

Any examination of the volatility of agricultural commodity prices experienced by Australian farmers is complicated by the fact that there is a lack of consistent, long term commodity price series that can be utilised for such analyses. This applies in particular for horticultural products

and some crops. Further, some of the available long-term price series provide averaged annual commodity price data, which can tend to smooth commodity price volatility relative to what is experienced by the manager of a farm business. As recent years have highlighted, there can be considerable price variation within a year around the annual average. Long-term (1980 to present) monthly agricultural commodity price data series for a number of Australian agricultural commodities are maintained by the International Monetary Fund (IMF 2011), although these are generally the prices prevailing at port of destination, rather than Australian farmgate prices.

There are a limited number of longer-term monthly price series data available for wool, beef and wheat which can be used to analyse whether price volatility has changed over recent years, although even these have limitations in that some of the data is sourced internationally. Table 4 provides details of available data sources, and a necessarily limited analysis of changes in commodity price volatility over recent decades.

Table 4. Index of relative volatility of prices for major Australian agricultural commodities.

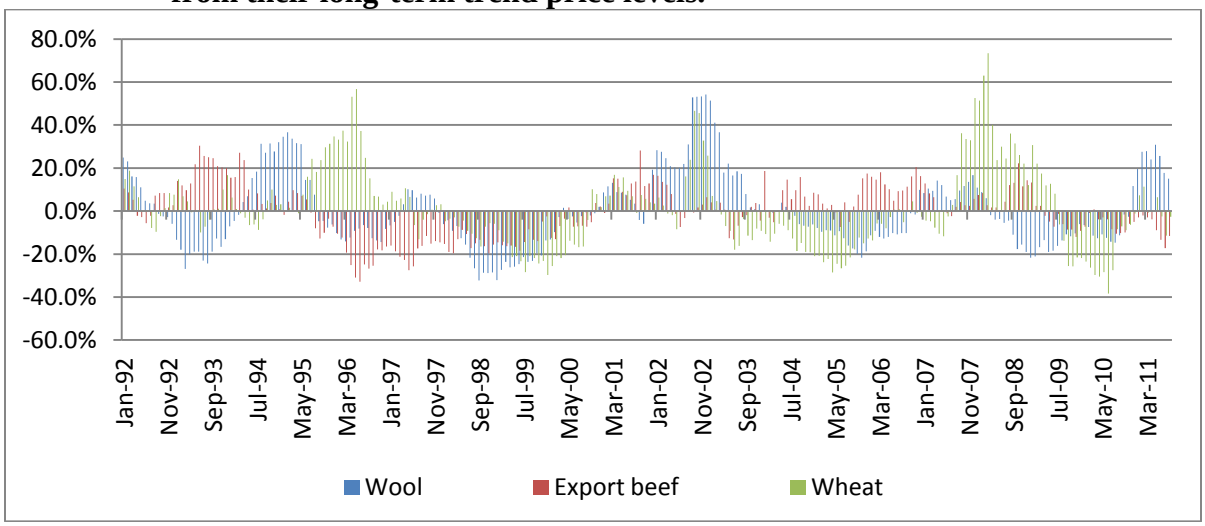
Commodity	Price series	Source	Between commodities	Within commodities over time			
			1980-2011	1980-1989	1990-1999	2000-2011	Average
Beef (export)	Average monthly export price $A, (1983-2011)	Westpac and MLA	82	86	132	82	100
Beef (domestic)	Eastern Young Cattle Indicator (EYCI) monthly, (1996-2011)	MLA	74		119	81	100
Wheat	US No.1 Hard Red Wheat FOB USA. Monthly, (1980-2011)	IMF	117	57	110	133	100
Wool	Eastern Market Indicator. Monthly average (1992-2011)	AWEX	126		103	97	100
Average			100				

Unfortunately, data limitations make the results less than conclusive, and the lack of data series extending back to the 1970s means it is not possible to compare current price volatility levels with those prevailing prior to the 1980s. The main conclusions from these results are that wheat and wool prices appear to be more volatile than beef prices; that beef and wool prices appear to have become less volatile in the most recent decade; and that wheat prices appear to have become more volatile over the most recent decades.

Analysis of the price volatility of different agricultural commodities also provides an opportunity to examine the extent to which movements of prices around long-term trends follow similar or different patterns. If the variations in commodity prices for different commodities follow similar trends, then enterprise diversification may not provide an opportunity to reduce farm business risk. Alternatively, if commodity price variations follow independent trends, enterprise diversification may provide opportunities to reduce business risks.

Figure 1 displays the percentage variation of actual commodity prices from long-term trends for three major Australian broadacre farm commodities. The graph indicates that generally, price variations for the three commodities tend to follow independent patterns, although it also highlights that there have been some periods (for example 1997-2000) where prices for all three commodities were lower than prevailing longer-term trends.

Figure 1. Percentage variation of the prices of three major broadacre commodities from their long-term trend price levels.



If commodity prices were the sole driver of farm revenue volatility, then it appears that enterprise diversification should provide farm business managers with a means of reducing farm business risk. However, as noted earlier it is the combination of seasonal and commodity price factors that determines broadacre farm revenue, therefore analysing commodity price trends in isolation does not provide a complete picture.

Management of volatility at the farm level.

A high level of volatility, in isolation, does not necessarily present a challenge for managers of farm businesses. For example, volatile but relatively high commodity prices can provide an opportunity for profitable farm operations given the availability of suitable risk management options or a strong farm balance sheet which enables ready access to finance. Generally, however, higher volatility presents greater management challenges for farm businesses because of the narrow operating margin of most farms, the fixed nature of farm assets, and the limitations presented by climate and natural resources such as land and water.

Farm survey data collected by ABARES over the past twenty year period provides an opportunity to examine how well Australian broadacre farmers have managed the volatile business environment in which they have been operating. ABARES surveys a structured sample of Australian broadacre farm businesses each year, obtaining both financial and production data. The resulting data is made available on the online ABARES Agsurf database, and is able to be disaggregated in a number of different ways. By examining changes in farm capital values, farm profits and farm debt levels over the period, some sense may be obtained of how well farm business managers are managing risks that are inherent in the volatile business environment in which they operate.

Data obtained from ABARES annual farm surveys over the period from 1990 to 2010 was used to examine in particular changes that have occurred in farm income and debt levels for crop farms and mixed livestock and crop farms. Because the data is subject to annual variation depending on commodity prices and seasons, a clearer picture of changes that have occurred can be obtained by comparing data averaged over a five year period. For this analysis, data averaged over two five year periods was used for the comparison (1990-94 and 2006-10). All values were expressed in 2009-10 dollars. The available data was disaggregated on the basis of commodity production (an all farm average, enterprises producing mainly crops, and mixed livestock and crop enterprises), on the scale of the farm (determined by gross turnover), and on the State in which farms were located. In each case, averages for the 1900-1994 period were compared with averages for the 2006-2010 period to obtain a clear perspective of changes that have occurred in those businesses over time. The results of the analysis are displayed in Table 5.

Table 5. Changes in farm financial characteristics, 1990 to 2010.

		Value of land and fixed improvements ($)	Farm business debt ($)	Total crop gross receipts ($)	Total cash receipts ($)	Net farm cash income ($)
Farm size/ Location	**Enterprise**	**Percent change from 1990-94 to 2006-10**				
All farms	All farms	159%	127%	67%	42%	21%
	Crops	224%	207%	54%	56%	11%
	Mixed crops/livestock	154%	91%	14%	19%	-8%
Less than $100,000	All farms	87%	14%	-44%	-20%	-74%
	Crops	74%	53%	-48%	-26%	-172%
	Mixed crops/livestock	121%	21%	-55%	-27%	-116%
$100-$200,000	All farms	81%	-1%	-51%	-30%	-59%
	Crops	105%	69%	-40%	-29%	-120%
	Mixed crops/livestock	98%	4%	-53%	-28%	-67%
$200-$400,000	All farms	91%	9%	-47%	-31%	-47%
	Crops	98%	35%	-39%	-32%	-71%
	Mixed crops/livestock	110%	12%	-45%	-28%	-53%
$400,000 +	All farms	105%	79%	18%	-1%	-9%
	Crops	175%	119%	12%	17%	3%
	Mixed crops/livestock	85%	61%	-4%	-9%	-15%
New South Wales	All farms	122%	113%	44%	26%	-24%
	Crop farms	210%	182%	15%	27%	-38%
	Mixed livestock/crops	124%	85%	-21%	2%	-54%
Victoria	All farms	139%	105%	87%	53%	69%
	Crop farms	173%	200%	35%	41%	10%
	Mixed livestock/crops	194%	85%	30%	39%	40%
Western Australia	All farms	261%	217%	116%	68%	53%
	Crop farms	367%	318%	92%	89%	52%
	Mixed livestock/crops	200%	125%	69%	37%	44%

The results displayed in the table show that, over the period from 1990 to 2010, the survey data indicates that average farm business debt levels for all broadacre farms increased by an average factor of 127%, but for specialist crop farms, the increase in average debt levels was 207%, almost double the national average. In comparison, mixed livestock and crop farms recorded an increase of 91% in average farm debt levels.

This significant increase in farm debt levels coincided with a much more modest increase in cash receipts (which include drought support payments), and relatively small changes in net farm cash income for the average Australian broadacre farm businesses. (Net farm cash income is calculated by deducting total farm cash costs from total farm cash receipts. Farm cash costs exclude debt repayment or owner/operator wages) The relatively small change in net farm cash incomes compared to change in total receipts is likely a result of input cost increases over the period, including interests costs associated with higher debt levels.

The data highlights that for mid-sized farms (that is, those with between $100,000 and $400,000 in annual turnover), the farm business debt levels of crop farms increased by more than that of similar-sized mixed livestock and crop farms over the period, but at the same time net farm cash income levels of crop farms declined by more than that of the mixed livestock crop farms, and more than the average for all farms. It is only in the case of the largest sized crop farms (those with turnover in excess of $400,000 per annum) that the change in net farm cash income was greater than that of the mixed livestock and crop farms. These results indicate that on average, mid-sized cropping businesses now appear to have much less capacity to manage volatility that was the case during the early 1990s.

At the State level, it is apparent that on-average, farmers in New South Wales experienced a reduction in annual farm cash income (in 2009-10 dollar terms) over the period, although it needs to be remembered that the state data includes large numbers of smaller-scale farms, and that average farm size is smaller in NSW and Victoria than in Western Australia. The period from 2006-2010 also included several years of severe drought which dramatically reduced crop production in NSW and Queensland, and this has undoubtedly had an impact on the data. Western Australia also experienced some difficult cropping seasons during this period, although not to the same extent as the eastern states.

In isolation, the increases in farm debt levels shown in Table 5 indicate that Australian broadacre farm businesses are now likely to be less able to manage business volatility than was the case during the 1990s, whilst at the same time evidence indicates that the business environment for these enterprises has become more volatile, and that applies in particular for grains and oilseed enterprises. The increase in debt levels has been accompanied in some instances by increases in gross farm revenue, which would have improved the capacity of farm businesses to manage additional, although increased costs, including interest costs, has meant that increases in net farm income have been much more modest.

A key indicator often used to judge whether or not a business will be able to manage debt is the equity ratio of the business. It would be anticipated that, given higher debt levels, this ratio would have declined over the last two decades. However, the ABARES survey data indicates that this is not the case, and that equity ratios have been relatively stable over the period in question, albeit with some reduction in equity ratios for crop specialists relative to all farms and mixed livestock crop farms.

Part of the reason for the relatively stable equity ratios is that there have been large increases recorded in the average value of land and fixed improvements for farms over the period, especially in the case of crop specialists, as can also be observed from the above table.

A critical question is whether these increases in the value of farm capital assets are as a consequence of increases in land values, or due to an expansion in the average area of land owned by the farm business. If the increases in capital values are largely a result of increases in land values, then observed equity ratios may not be a reliable gauge of the ability of the farm business to service increased debt, and ultimately to manage volatility. The data displayed in Table 6 provides some information to assist in answering this question.

Table 6. Changes in farm areas, 1990 to 2010.

		Area operated (Hectares)	Area cropped (Hectares)
Farm size/ location	**Enterprise**	**Percent change from 1990-94 to 2006-10**	
Australia	All farms	14%	82%
	Crop farms	79%	85%
	Mixed livestock/crops	27%	29%
< $100,000	All farms	39%	4%
	Crop farms	-4%	10%
	Mixed livestock/crops	8%	-11%
$100-$200,000	All farms	-48%	-10%
	Crop farms	27%	29%
	Mixed livestock/crops	-6%	-12%
$200-400,000	All farms	-34%	-15%
	Crop farms	-4%	2%
	Mixed livestock/crops	-15%	-10%
$400,000 +	All farms	-45%	28%
	Crop farms	40%	30%
	Mixed livestock/crops	1%	0%
New South Wales	All farms	19%	110%
	Crop farms	93%	74%
	Mixed livestock/crops	48%	38%
Victoria	All farms	31%	108%
	Crop farms	57%	99%
	Mixed livestock/crops	-3%	23%
Western Australia	All farms	3%	95%
	Crop farms	72%	81%
	Mixed livestock/crops	12%	42%

It shows that average farm land areas have increased by 14% over the period, but in the case of crop farms the average increase in land area over the two decades was almost 80%. The greatest increases in average farm land areas appear to have occurred in NSW and Western Australia, and

for farms with more than $400,000 in annual turnover. The data displayed in table 6 also highlights that the average area cropped per farm per annum has increased by substantially more than the increase in average farm area, indicating that cropping intensity (the proportion of total farm area sown to crop) has increased over the period, and that on mixed enterprise farms, cropping enterprises have become more important over the period under examination.

The fact that the percentage increase in farm land area has been less than the increase in the value of farm capital assets does indicate that at least a significant component of the increase in farm capital asset values may have been due to increases in average land values per hectare, and not just due to increases in average farm land area. This is confirmed by data available from a number of sources which shows that average farm land values per hectare increased quite rapidly in Australia in the years after 2001, which was a year of strong financial returns for many broadacre farm businesses in Australia. This has implications in that the increases in farm land values has provided an opportunity for farm businesses to increase debt while retaining equity levels, but may not mean that cash-flows to service that debt have also increased.

Discussion and conclusions.

The analysis reported here identifies that in relative terms, Australian farm business managers operate in a more volatile business environment than virtually any other national group of farmers world-wide. It also confirms some earlier analysis carried out by the Productivity Commission which identified that the agriculture sector is the most volatile sector of the Australian economy, and has experienced more than twice the average level of volatility of the economy as a whole over the past two to three decades. These two results highlight the critical importance of risk management for the future success of farm businesses in Australia.

The fact that Australian farm business managers achieve profitable outcomes in such a volatile business environment indicates that the sector as a whole is very skilled at managing risk. This is especially the case, given that farmers in Australia receive some of the lowest levels of direct and indirect support from governments of any national farm group.

An important point which emerges from this analysis is that Australian farm business managers and their advisors need to understand the important difference between agricultural businesses and other businesses in the Australian economy. A recommendation, for example, that farm businesses should be able to maintain debt levels or debt/equity ratios that are ‘normal’ for businesses in the non-agricultural economy, or that farm businesses take on extra debt because they have ‘lazy’ balance sheets in comparison with non-agricultural businesses, ignores the reality of risk in Australian agriculture, and the importance of maintaining financial reserves (either as cash, off-farm investments or borrowing capacity) in order to be able to successfully manage the level of risk inherent for the sector.

The limited analysis of volatility in different sub-sectors of Australian agriculture highlights, as expected, that the more intensive sub-sectors such as horticulture and intensive livestock have experienced a relatively less volatile business environment over recent decades, and the broadacre grains and oilseeds sub-sectors have experienced a relatively more volatile business environment than the average for the agriculture sector as a whole. To some degree the volatility in the broadacre grains and oilseeds sub-sectors may be a consequence of decisions by farmers not to plant crops in seasonally-adverse years, although analysis reported elsewhere (Kingwell,

2010) appears to indicate this is not the case, and that the biggest factor in the volatility recorded is yield variance, rather that changes in the total areas of crop planted.

The analysis of farm-level data arising from annual farm surveys conducted by ABARES indicates that the broadacre grain and oilseeds sub-sectors of Australian agriculture have emerged from the last two decades with considerably higher debt levels than the average for the agriculture sector as a whole, suggesting that those farm businesses may now be more vulnerable to business volatility than was the case in the past. To some extent the increase in debt levels for broadacre crop producers was undoubtedly related to the succession of drought years that occurred over the period from 2002 to 2009.

It is apparent from the farm survey data that medium-sized broadacre farm businesses on average have higher debt levels which appear to be sustainable from a farm equity perspective, but these farm businesses have also experienced reductions in both gross and net farm receipts over the same period, meaning that these businesses are actually less financially sustainable from a debt servicing perspective. This result highlights that reliance on equity levels as a measure of the financial viability of broadacre farm businesses is unwise.

The survey data also indicates that broadacre farm businesses specialising in crop production have increased debt levels by substantially more than the average Australian farm business over the past two decades; have in part used that debt to acquire extra land; but have not experienced increases in either gross or net farm revenue over that period. An above-average harvest result in 2011/12 (especially in Western Australia) will undoubtedly assist in improving the business situation of these crop producers, but the overall picture that emerges is that these farm businesses in particular are now likely to be more vulnerable to a volatile business environment than they were during previous decades, at a time when the volatility of the business environment for Australian broadacre farms appears to have increased.

What also emerges from the farm survey data is that for mid-sized farm businesses (those with annual farm turnover of between $100,000 and $400,000 which make up approximately 40% of all broadacre farms), those businesses categorised as ‘mixed livestock and crops’ appear to have emerged from the past two decades with relatively less debt, and with total cash receipts and net farm income less adversely impacted than is the case for those farm businesses categorised as crop specialists. There are a number of factors that could lead to this outcome apart from the relative volatility of the cropping and livestock sub-sectors (for example geographical differences in the location of survey farms which could mean differing seasonal conditions experienced by the farm businesses in each category) however the results tend to confirm the anecdotal observations of farm business consultants and farm finance providers that the highest levels of farm financial stress is observed amongst medium-scale specialist crop businesses, many of which no longer include a livestock enterprise as part of the farm enterprise mix.

This result indicates that there has been insufficient attention paid to the different levels of risk associated with different broadacre farm enterprises, and in particular combinations of enterprises, and the costs of exposure to those risks in the business decisions of farm managers and their advisors over recent decades.

This conclusion supports the results of earlier analysis by Hutchings and Nordblom (Hutchings and Nordblom 2011) who concluded that "…*static measures of financial performance (gross margins, profit and cash margins) do not characterise the risk-adjusted performance of the various farming systems and almost certainly result in a flawed specification of best-practice farm management in south-eastern Australia."*

In the wheat-sheep zones of Australia, a simple comparisons of published gross margins per hectare that were achievable for different farm enterprises would certainly have provided encouragement for a farm business manager or business advisor to choose either a crop-only enterprise, or a combination of crops and livestock that heavily favoured cropping over much of the past two decades. However, farm financial results over the same period indicate that farm profitability over the longer term is more likely to be maximised if the farm business involves an enterprise mix including both livestock and cropping enterprises. This suggests there is a need for a more sophisticated discussion about risk in farm business enterprise choices, and in particular the extent to which different combinations of enterprises may assist in moderating some of the risk (and the cost of the risk) faced by Australian broadacre farm businesses. This conclusion is supported by the results displayed in Figure 1 above, which reveal that it is relatively rare for the prices of the major commodities that are produced on Australian broadacre farms to be all experiencing negative price anomalies at the same time, and that therefore, multiple enterprises provide some mitigation of risk in comparison with single enterprises.

It is noteworthy that there has been a greater focus amongst research providers over recent years on systems approaches to broadacre farm management for agronomic and natural resource management reasons, although there has perhaps not been a similar focus on a systems (rather than individual enterprise) approach to farm management from a business and risk management perspective. Recent research published by Lewis et. al. (Lewis et al 2010) discussing risk in the context of pasture management systems for high rainfall zone livestock production provides an example of the more sophisticated and dynamic analysis that is required to fully understand both the potential profitability and risk associated with different management systems.

References.

ABARES, 2012. Australian Bureau of Agricultural and Resource Economics and Sciences. AgSurf online database. Accessible at http://abare.gov.au/ame/agsurf/agsurf.asp

Anton J and Kimura S 2009. An assessment of farmer's risk exposure and policy impacts on farmer's risk management strategy. Paper prepared for presentation at the 113th EAAE Seminar "A resilient European food industry and food chain in a challenging world", Chania, Crete, Greece, September 2009.

Chatellier V 2011. Price Volatility, market regulation and risk management: challenges for the future of the CAP. Working Paper SMART-LERECO No. 11-04. Presented to the Committee on Agriculture and Rural Development of the European Parliament. February 2011, Brussels.

Coble K and Dismukes R 2008. Distributional and Risk Reduction Effects of Commodity Revenue Program Design. Paper presented at the Allied Social Sciences Association Annual Meeting, New Orleans, Louisiana, January 2008.

FAO 2011. Price Volatility in Food and Agriculture Markets: Policy Responses. Policy Report prepared at the request of G20 leaders by the FAO, IFAD, OECD, UNCTAD, World Bank, WTO, IFPRI, and the UN HLTF. June 2011.

Gilbert C 2011. "International Agreements for Commodity Price Stabilisation: An Assessment." OECD Food, Agriculture and Fisheries Working Papers, No. 53. OECD Publishing. http://dx.doi.org/10.1787/5kg0ps7ds0jl-en

Gilbert C and Morgan C 2010. Food Price Volatility. Philosophical Transactions of the Royal Society B. V 365, pages 3023 – 3034.

HLPE 2011. Price Volatility and Food Security. A report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security, Rome 2011.

Hutchings T and Nordblom T 2011. A financial analysis of the effect of the mix of crop and sheep enterprises on the risk profile of dryland farms in south-eastern Australia. Paper presented at the Australian Agricultural and Resource Economics Society 55th Annual Conference, Melbourne 2011.

Kimura S and Anton J 2011. Farm Income Stabilization and Risk Management: Some lessons from Agristability Program in Canada. Paper prepared for presentation at the EAAE 2011 congress on Change and Uncertainty Challenges for Agriculture. Switzerland, 2011.

Kimura S, Anton J and LeThi C 2010. Farm Level Analysis of Risk and Risk Management Strategies and Policies. Cross Country Analysis. OECD Food, Agriculture and Fisheries Working Papers No. 26. OECD Publishing. http://dx.doi.org/10.1787/5kmd6b5rl5kd-en

Kingwell R 2011. Revenue volatility faced by Australian wheat farmers. Paper presented at the Australian Agricultural and Resource Economics Society 55th Annual Conference, Melbourne 2011.

Lewis C, Malcolm B, Fraquharson B, Leury B, Behrendt R and Clark S 2010. Profitability and risk evaluation of a novel perennial pasture system for livestock producers in the high rainfall zone: Context, Approach and Preliminary Results. Paper presented at the Australian Agricultural and Resource Economics Society 54th Annual Conference, Adelaide 2010.

OECD 2011. *Managing Risk in Agriculture: Policy Assessment and Design.* OECD Publishing. Accessible at http://dx.doi.org/10.1787/9789264116146-en

Poon S and Weersink A 2011. Factors Affecting Variability in Farm and Off-farm Income. Paper published by the Structure and Performance of Agriculture and Agri-products industry Network, Canada. 2011.

Productivity Commission 2005. *Trends in Australian Agriculture.* Productivity Commission Research Paper, Canberra. 2005.

Roberts M, Osteen C and Soule M 2004. Risk, Government Programs and the Environment. United States Department of Agriculture Economics Research Services. Technical Bulletin No. 1908. March 2004.

Spica J 2010. Global trends in risk management support of agriculture. Agris on-line papers in Economics and Informatics. Vol 2, No. 4, 2010.

Winsen F, Wauters E, Lauwers L, de Mey Y, van Passel S and Vancauteren M 2011. Increase in milk price volatility experienced by Flemish dairy farmers: A change in risk profile. Paper prepared for presentation at the EAAE 2011 congress on Change and Uncertainty Challenges for Agriculture. Switzerland, 2011.