

# Revenue volatility faced by Australian wheat farmers

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# Wheat production in Australia

- Wheat is Australia's main agricultural crop.
- Often around 13 million hectares are planted annually resulting in production that can range from 10 to 26 million tonnes.
- Australia's exports of wheat range from 7 million to 18 million tonnes annually and
- The international price of wheat over the last 25 years has ranged from 110 US\$/t to over 360 US\$/t.



# A farmer's management task

- Farm income variability has long been of interest to agricultural economists in Australia (e.g. Harris *et al.* 1974; Mauldon and Schapper 1974; IAC 1978; Quiggin and Anderson 1979; Productivity Commission 2005)
- There's been much policy discussion about price stabilization, crop insurance, drought and natural disaster policies but...
- little investigation of the components of revenue variability in recent decades. It's timely to re-visit this issue.



$$\ln(R) = \ln(P) + \ln(A) + \ln(Y)$$

# Decomposing revenue variance

A farm's or region's wheat revenue is the multiplicative outcome of wheat price, wheat area and wheat yield.

*Wheat revenue = Wheat area x wheat yield x wheat price*

$$\ln(R) = \ln(P) + \ln(A) + \ln(Y)$$

$$\begin{aligned} \text{Var}[\ln(R)] &= \text{Var}[\ln(P)] + \text{Var}[\ln(A)] + \text{Var}[\ln(Y)] \\ &\quad - 2\text{Cov}[\ln(P), \ln(A)] - \\ &\quad - 2\text{Cov}[\ln(P), \ln(Y)] - 2\text{Cov}[\ln(A), \ln(Y)] \end{aligned}$$

# How has wheat revenue variance changed?

	Wheat revenue variance (linear area trend)	Wheat revenue variance (7-year moving average area trend)	
<b>NSW</b>			
1992 to 2009	0.40	1992 to 2006 0.20	
1973 to 1991	0.13	1973 to 1991 0.09	
1955 to 1972	0.15	1955 to 1972 0.10	
1955 to 2009	0.23	1955 to 2006 0.13	
<b>WA</b>			
1992 to 2009	0.10	1992 to 2006 0.09	
1973 to 1991	0.07	1973 to 1991 0.06	
1955 to 1972	0.07	1955 to 1972 0.04	
1955 to 2009	0.10	1955 to 2006 0.09	
<b>SA</b>			
1992 to 2009	0.20	1992 to 2006 0.12	
1973 to 1991	0.08	1973 to 1991 0.08	
1955 to 1972	0.11	1955 to 1972 0.07	
1955 to 2009	0.15	1955 to 2006 0.11	
<b>QLD</b>			
1992 to 2009	0.17	1992 to 2006 0.19	
1973 to 1991	0.09	1973 to 1991 0.09	
1955 to 1972	0.11	1955 to 1972 0.07	
1955 to 2009	0.11	1955 to 2006 0.11	
<b>VIC</b>			
1992 to 2009	0.38	1992 to 2006 0.19	
1973 to 1991	0.14	1973 to 1991 0.11	
1955 to 1972	0.15	1955 to 1972 0.07	
1955 to 2009	0.22	1955 to 2006 0.13	



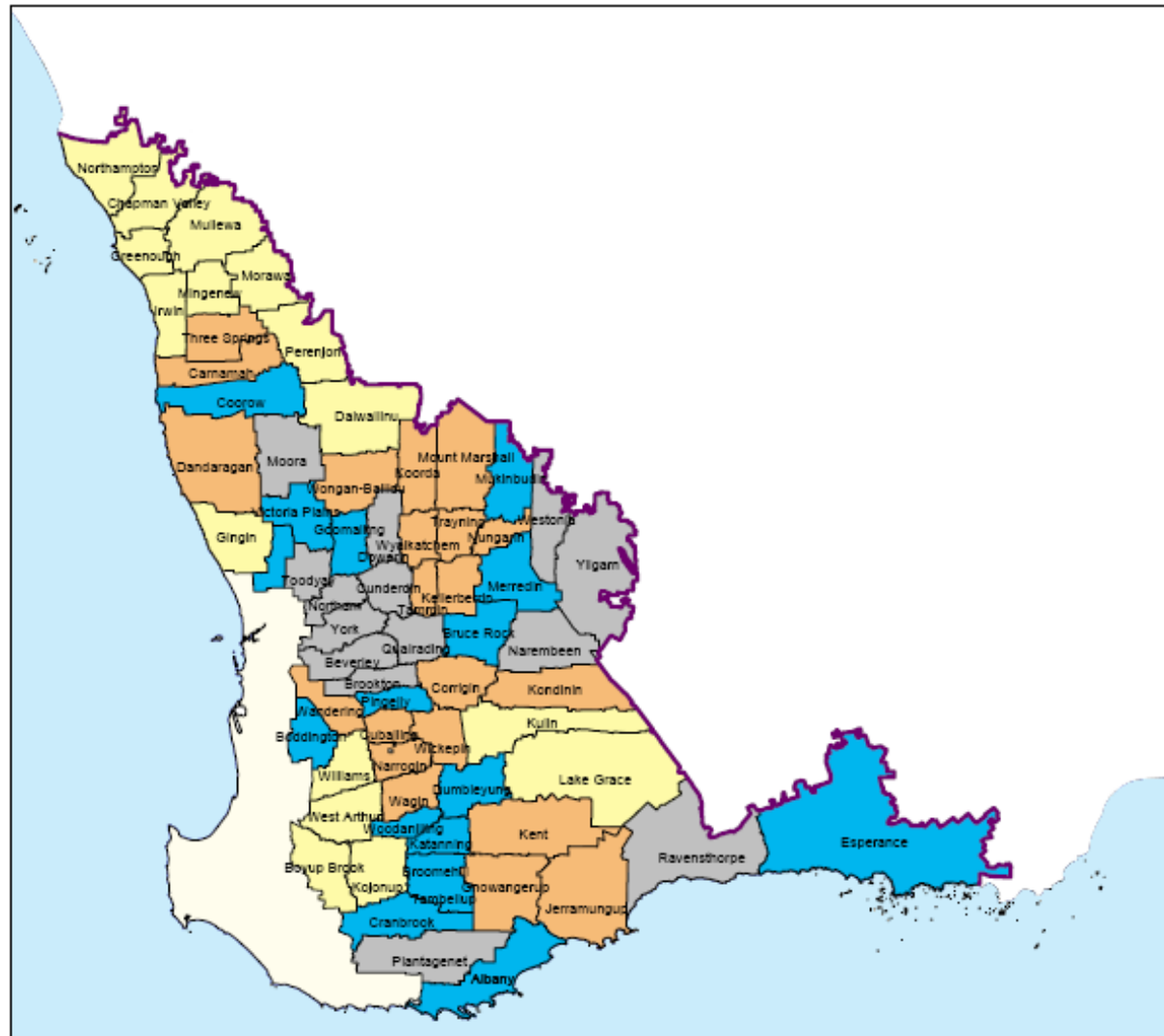
# Components of the revenue variance

	Variance			Covariance		
	area %	yield %	price %	area,yield %	yield,price %	price,area %
<b>NSW</b>						
1992 to 2006	4.86	80.34	14.79	12.74	-1.17	-2.26
1973 to 1991	5.28	62.95	31.77	6.84	-7.62	-0.63
1955 to 1972	12.40	50.00	37.60	7.55	5.33	-0.21
1955 to 2006	6.38	58.66	34.97	8.99	0.72	-0.46
<b>WA</b>						
1992 to 2006	5.48	53.23	41.29	8.64	-5.65	-5.59
1973 to 1991	6.64	38.83	54.53	-2.13	-4.76	2.79
1955 to 1972	4.15	22.64	73.20	0.55	14.75	2.31
1955 to 2006	3.95	31.71	64.35	2.17	-4.22	0.26
<b>SA</b>						
1992 to 2006	1.34	73.63	25.03	-1.62	9.44	0.44
1973 to 1991	4.71	67.24	28.05	5.31	4.58	1.06
1955 to 1972	4.84	44.59	50.58	4.93	9.43	1.69
1955 to 2006	2.93	53.32	43.74	2.14	2.81	1.53
<b>VIC</b>						
1992 to 2006	1.43	83.12	15.45	3.13	6.07	-0.40
1973 to 1991	6.64	70.88	22.48	5.83	0.61	0.97
1955 to 1972	18.37	29.36	52.27	1.03	8.39	1.03
1955 to 2006	6.05	58.57	35.38	3.19	5.01	1.13
<b>QLD</b>						
1992 to 2006	39.96	42.71	17.33	29.00	-13.72	-10.47
1973 to 1991	23.35	60.13	16.52	23.41	1.54	-0.09
1955 to 1972	10.32	60.52	29.16	11.93	20.02	-1.21
1955 to 2006	21.89	49.21	28.90	20.27	4.23	-3.06

# The spatial story is more complex....

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VARIATION IN DETRENDED SHIRE WHEAT YIELDS  
For the 35 year periods 1940 - 1974 and 1975 - 2009

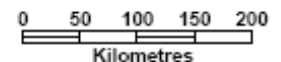


### Legend

— Shire Boundary

Ratio of coefficients of variation of shires detrenned wheat yields

- < 1.3
- 1.3 to < 1.5
- 1.5 to < 1.8
- $\geq 1.8$



Projection: Transverse Mercator  
Date: January 2011  
Job Number: 2011014

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# Key findings regarding wheat revenue volatility

- Revenue volatility over the last 15 years has doubled
- Greater yield variance is the main cause of the greater revenue variance
- More frequent very low yields are the principal cause of greater yield variance
- Price variance has also increased (but not its percentage as a component of revenue variance)
- NSW and VIC have experienced a pronounced increase in revenue variance over the last 15 years.
- WA wheat revenue variance has increased by the least

# Implications for farmers and governments

- Farmers' responses to the increase in wheat revenue variance are a range of short-term seasonal actions as well as longer term structural choices
- If the size and nature of the volatility of the last 15 years continues then Australian wheat farmers will face huge structural problems.
- Governments' responses are likely to be highly constrained by their need to limit their expenditures.

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THANK YOU