The role of local production and the world price in setting local wheat, wool, and beef prices

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Abstract. The Australian dollar is considered primarily a commodity-based currency. The high level of commodity-based exports in Australia's trade balance is given as an explanation. Accordingly changes in world commodity prices should bring commensurate changes in the value of the Australian dollar, such that changes in world commodity prices are only partially transmitted to the Australian economy and local farm-gate prices.

If this relationship holds, then local farm-gate prices should be significantly less volatile than their respective world price. Variances in local prices would be due to local factors (e.g. variances in local production) rather than variances in the world price and international factors.

This paper examines the farm-gate prices of Australia's three largest agricultural commodities, wheat, beef, and wool; seeks to establish if the variances in these prices are more closely related to movements in their respective world price or local production factors and, if movements in the Australian dollar decrease local farm-gate variance as expected.

Keywords: farm economics, farm business management, agricultural risk management, commodity prices

Introduction

The marketing of agricultural commodities is a critical part of farm management. An important part of the marketing process is establishing the key factors that affect the local price, e.g. the world price of the commodity, the levels of production and demand both locally and internationally, and the value of the exchange rate. The role of the exchange rate is important as it has an impact on the international competitiveness of Australia's traded goods, including agricultural commodities. However the Australian dollar is often considered a commodity based currency, i.e. where the exchange rate moves in unison with world commodity prices, such that the impact on local commodity prices is largely neutralized. This relationship has been evidenced in studies of the Australian exchange rate and Australia's terms of trade. However the relationship at an agricultural level has not been studied in depth. This paper undertakes preliminary analysis to establish whether the key concepts of a commodity currency model hold for beef cattle, wool, and wheat.

The Australian dollar as a commodity currency

Trade theory suggests that the exchange rate is a price, which, like all prices when flexible, serves to keep a market in equilibrium. In this case the equilibrium is Australia's balance of payments with the rest of the world. In a commodity-based currency, movements from equilibrium are often caused by substantial fluctuations in the prices of commodities traded by Australia.

Clements and Freebairn (1990) provide an overview of a commodity currency model. For example a boom in world commodity prices will see higher export values in the economy (through the increased price received by exporters) and these higher values entering the economy will lead to an increase in domestic based expenditure by the export sector. This increase in expenditure will increase domestic prices in non-traded goods, which increases inflationary pressures within the domestic economy. These increased inflationary pressures lead to increased nominal and real local interest rates, which lead to higher capital inflow into the economy and an appreciation in the value of the exchange rate.

Blundell-Wignal et al. (1993) provides a similar model indicating that for a commodity-dominant exporting country like Australia, the

terms of trade are particularly important in influencing current domestic and foreign excess demand for domestic goods. A rise in the terms of trade (e.g. through higher world commodity prices) generates strong external demand for Australian commodities. Such a relative price shift, if perceived to be permanent, implies a permanent real income transfer to Australia from the rest of the world. This increases domestic demand for traded and non-traded goods, and at a time when foreign demand is already strong. The exchange rate rises to offset these tendencies, switching demand towards relative cheaper imports of foreign goods.

Pitchford (1993) believes that a reasonably freely floating rate should provide a degree of insulation from changes in the terms of trade. Blundell–Wignal et al. (1993) evidenced a clear positive relationship between the terms of trade and the real exchange rate. Their analysis shows that the terms of trade has a powerful impact on the equilibrium level of the real exchange rate – correlation around 0.8, i.e. if the terms of trade rise 10%, the equilibrium real exchange rate changes by 8%.

Sjaastad (1990) observed that in the period 1984 - 1990, 85% of short-term fluctuations in external prices of traded goods were neutralized in the same quarter. Given the high percentage of commodities in Australia's traded goods, it can be assumed that this relationship applies for the external prices of export commodities. Thus since the float in 1983 the Australian dollar may have become more of a commodity currency rather than less of a commodity currency because of the commodity basis of exports and the floating exchange rate combined.

Sjaastad (1990) further suggests that as most commodities are traded in organised markets, international arbitrage ensures that a change in any exchange rate will result in a commensurate change in the prices of internationally traded commodities in at least one currency. If a country is a price-taker on the world traded market, then any changes in its exchange rate or price level will not have an effect on the external price of the good, but rather the local price.

Alternatively if a country is a price maker than any change in its own exchange rate or price level will be reflected in a proportionate change in the price of the good in all other currencies rather than the local price.

This relationship between the terms of trade and the exchange rate has significant implications for Australian commodity producers, as any changes in external commodity prices should largely be neutralized by commensurate changes in the exchange rate, usually within the same quarter. This suggests that the local price received by local producers should be less volatile than the respective external price, as movements in the exchange rate will neutralize the movements in the external price.

A shortfall of the commodity currency model is that it has examined the relationship between the terms of trade and the exchange rate or a significant commodity index and the exchange rate. The relationship between an individual commodity and the exchange rate may be different should individual commodity price movements differ from those of the wider index, or the resulting change in the exchange rate from changes in the individual world price is limited given the relative size of the commodity within Australia's terms of trade.

The role of Australian beef, wool, and wheat

The role of all commodity exports in Australia's trade is highlighted in Table 1 (see Appendix).

By value, farm commodities contribute approximately 20% of total Australian exports and this has remained largely steady over the last 20 years. Similarly resource commodities have also remained at a stable percentage, albeit at twice the contribution of farm-based commodities. The increase in manufacturing-based exports has been largely offset by the commensurate decrease in other commodity exports. The contents of the classification "other commodities" requires further investigation, however for the purpose of this paper it is sufficient to note that it does not involve wheat, beef, or wool exports.

The three farm commodities of beef cattle, wool, and wheat have been chosen in this paper as they contribute a significant portion of the farm commodity sector (see Table 2, see Appendix).

Whilst Table 2 (see Appendix) shows that the role of wheat, wool, and beef cattle within the farming sector has diminished over the last 20 years, they still dominate the next tier of farm-based commodities such as sheep meat (1.1% of total exports in 2002/03), dairy products (1.6%) and cotton (0.8%). The largest resource commodity export is coal (8.1% of total exports in 2002/03), followed by crude petroleum (5.7%) and aluminium (5.2%).

Beef Cattle

In 2002/03 world beef cattle production totalled 579 million metric tonnes (dressed) of

which Australian production was 2.1 million metric tonnes (dressed), i.e. 0.2% of total world production. World beef cattle production is largely domestically traded, with only 6.1 million tonnes traded externally (1% of total production) and the balance consumed domestically.

In a world market that is largely domestically based, Australia exports some 65% of its annual production (i.e. 1.4 million tonnes), thereby providing 22% of the world beef cattle trade.

The major export competitors are the United States (18% of world beef cattle trade), Brazil (15%), and Canada (10%), whilst major importers include the United States (36% of world beef imports), Japan (17%) and the Russian Federation (16%).

The United States is a key participant in the traded beef cattle market, being both a major importer and exporter. However their trade only represents some 8% of their total beef cattle production and relates to shortfall / surplus grades of beef and veal.

Whilst Australia is a significant supplier to the traded market, Australian exports can be largely considered a price taker on world markets given the dominant role of the United States on both sides of the traded market. Thus the Australian exchange rate against the United States dollar ($A / USD) is considered the most relevant exchange rate to utilize in this analysis. The United States import beef cattle price is considered a suitable foreign price indicator.

Given the high percentage of Australian production exported, the local price should be highly influenced by the underlying world price, in this case the US domestic beef cattle price. However, under the commodity currency model movements in the world price should be insulated from local producers by corresponding movements the $A / USD.

Wool

In 2002/03 world greasy wool production totalled 2.155 million tonnes of which Australia produced 535,000 tonnes. Of this total production, some 806,000 tonnes was traded i.e. 37% of total world production.

Of this total greasy wool world trade Australia exported some 502,000 tonnes, i.e. 62% of total world trade ahead of major export competitors include New Zealand (22% of world trade), Uruguay (9%), and Argentina (4%).

Given the dominant role of Australia in greasy wool trade Australia should be considered a price maker on the world market. Furthermore, as wool export sales are largely denominated in United States dollars, the $A / USD should also impact on this world price, as a price maker any movements in the $A / USD should impact the world price rather than the local price.

Based on these factors Australia has a market leading position, Australian production would influence the amount of world supply, the local price, and by default the world price. In addition the $A / USD should influence the world price, given that Australia is considered the price maker in world wool trade.

Wheat

In 2002/03-world wheat production totalled 567 million tonnes, of which Australia contributed 10.8 million tonnes. The major producers include the European Union (103 million tonnes), China (90.3 million), India (72 million), the Russian Federation (51 million) and the United States (44 million). However wheat production is largely a domestically based commodity with world wheat trade in 2002/03 totalling 104.7 million tonnes, i.e. 18% of world production.

Whilst only contributing a small portion of total world production, Australia is a significant supplier to world wheat trade, supplying in 2002/03 some 9.4 million tonnes (9%) of world wheat trade. Our major export competitors include the United States (22% of total wheat trade), the European Union (15%) and the Russian Federation (12%).

Based on this the United States is considered a major participant in the world wheat trade, providing some 22% of total trade through exporting some 50% of their annual wheat production. In comparison Australia has averaged exports of 78% of its total wheat production over the last five years.

Australia can largely be considered a price taker on the traded wheat market, with the world wheat price dominated by the domestic price in the United States, given its role in the traded wheat market. Given the high percentage of Australian production exported, the local price should be highly influenced by the underlying world price (in this case the USA domestic wheat price). However, movements in this price should be insulated from local producers by the $A / USD exchange rate under the commodity currency model.

Do the results support this?

The key question is whether these relationships hold for each commodity, and if so, are some

relationships more significant than others. Preliminary analysis has been undertaken using data sourced from Australian Commodity Statistics 2003 published by the Australian Bureau of Agriculture and Resource Economics (ABARE) and from software database Proview Navigator, a financial market database program.

Descriptive statistical and correlation analysis has been undertaken using selected annual data for beef cattle, wool, and wheat for the 20 years since 1984. This time period represents the period since the Australian exchange rate was floated and financial markets deregulated. This latter process contributed to the transfer of local price risk management from statutory marketing and regulatory bodies to producers.

Beef Cattle

The local price is represented by the annual weighted average price of yearling, ox, and cow sales on an export quality estimated dressed weight basis. This quotation is based on the annual average of stock prices in each major state market, weighted by the annual production in each state.

The world price is represented by the average unit value per kilogram of Australian boneless frozen beef exports to the United States expressed in United States currency. This price is selected given the significant role of the United States in the beef cattle market and that traded beef in the United States represents only eight percent of their annual production. Thus the export price for beef to the United States would be closely related to the underlying domestic price.

The $A / USD is calculated as an average of closing price for each calendar month within each financial year. Annual Australian production is expressed in kilo tonnes on a dressed weight basis.

Key Correlations are detailed in Table 3 (see Appendix).

From Table 3 there is a positive correlation of 0.31 between the world price and the value of the $A / USD as expected in the commodity currency model, although the weakness of the correlation provides an intriguing result. Contrasting this is a strong negative relationship between $A / USD and the local price, i.e. the local price increases as the $A / USD depreciates and vice versa. Whilst a depreciation in an exchange rate should lead to an increase in international competitiveness and higher local price, it does complicate the role of the $A / USD and suggests it has a stronger relationship with the local price rather than as neutralizing the world price under the commodity currency model.

The correlations between production and the local price and world price respectively are also interesting. The negative relationship between annual production levels and the world price is expected, although the strength of the correlation is surprising given the role of Australian beef cattle exports in the traded market. More surprising is the high positive correlation between the local price and the level of annual production, which suggests that local prices are higher when production is high and local prices are lower when production is low.

As expected under the commodity-currency model the local price has minimal correlation with the world price although the strong negative correlation between the local price and the $A / USD suggests that this latter price has a larger correlation with the local price than acting solely as an insulator to movements in the world price.

The strong negative relationship between the $A / USD and production suggests that the level of the $A / USD has been low when production is high, with a lower exchange rate assisting export competitiveness in times of high production. In contrast when the $A / USD has been high, production is low and the impact of decreased export competitiveness on the local price is perhaps not as great due to low supply conditions in the domestic market. Whether this is a coincidental relationship or a causal relationship would require further investigation.

The mixed result on whether the beef cattle data support the commodity currency model is further supported by the key descriptive statistics highlighted in Table 4 (see Appendix). If the model functioned correctly and the $A / USD acted as an insulator to changes in the world price, the variation of local price around the mean would be less than the variance of both the world price and the $A / USD. The statistics show that the local price varies further from its mean than either the world price or the $A / USD, suggesting that either the commodity currency model does not hold and other independent variables (e.g. production) may impact on the local price.

Wool

The local price is represented by annual average auction price for greasy wool in Australia. As Australia is the major participant in the traded wool market, the local price can be considered the major price indicator in the

world market. For comparative purposes in this paper, the New Zealand export price is considered an appropriate proxy of the world price given New Zealand's position as second largest producer in the traded wool market. The New Zealand export price has been converted to Australian dollar terms using the annual average Australian exchange rate with New Zealand. This conversion is beneficial as it eliminates the influence of the New Zealand exchange rate such that only exchange rate variance is that of the $A / USD, of which the majority of wool export receipts are domiciled. Production is annual Australian total greasy wool production.

As a price maker in a commodity currency model there is a strong correlation between the local price of wool and the world price.

There is a correlation between the $A / USD and the local price. This negative correlation is expected as depreciation in our exchange rate will increase our international competitiveness and increase the local price and vice versa for an appreciation in the exchange rate. The positive relationship between the world price and $A / USD suggests that as Australia is the price maker for this commodity, the impact of an appreciation in the $A / USD will also occur in the world price as well as the local price, and the higher world price will partially insulate the impact of an appreciation of the $A / USD.

A surprising result is that there is almost no correlation between local production and the local price however local production has a stronger correlation with the export price. An explanation could be that the level of Australian production impacts on the world price, which then impacts on the local price. Further analysis in this particular relationship is warranted given that these relationships may have been impacted by surplus supply as the wool stockpile has been reduced over the last seven years.

Together these results suggest that the key relationships in the wool traded market evidence similar characteristics to those expected in the commodity currency model but the results are mixed.

The descriptive statistics from Table 6 (see Appendix) further confirm that the commodity currency model does not hold completely for the wool market. Surprisingly the variance from the mean of the local price is greater than that of the world price, where the role of a price maker in the commodity currency model would be expected to show lower variance from the mean.

In summary the results for the local wool price are mixed. Whilst the key relationships are consistent with that of a price maker in a commodity currency model, the variance of the local wool price from its mean is greater than that of the world price. This variance may be attributable to the recent reduction in the wool stockpile; however further investigation of this would be required.

Wheat

The local price is represented by the Australian Wheat Board Limited (AWB) export quote, i.e. the average of daily asking prices for Australian standard white wheat FOB eastern states. This is considered an acceptable benchmark given that over 75% of wheat production is exported annually and the AWB has monopoly rights over these exports. The world price is export price for US hard red winter wheat, i.e. the major competitor grain and country to Australian wheat. Production is annual Australian wheat production.

From Table 7 (see Appendix) there is a positive correlation between the world price and the value of the $A / USD as expected in a commodity currency model, and the strength of this correlation is higher than that for beef cattle and wool. Contrasting this is a strong negative correlation between $A / USD and the local price, i.e. the local price increases as the $A / USD depreciates and vice versa. Whilst a depreciation in an exchange rate should lead to an increase in international competitiveness and higher local price, it does complicate the role of the $A / USD in the model as and on balance the $A / USD appears to have an equal strength relationship with the local price as well as the world price.

The impact of production on both the local price and world price is also intriguing. The negative correlation between annual production levels and the world price is expected, although the strength of the relationship is surprising given the role of Australian wheat exports in the traded market. More surprising is the lack of relationship between the local price and the level of annual production, implying that the production of wheat in Australia is not sensitive to local price.

Another feature is the strong positive correlation between the world price and the local price, i.e. both rise and fall together. Thus the local price is not insulated from the world price rather they have a strong relationship.

There is also a strong negative relationship between the $A / USD and production, which is consistent with the relationship between the

world price and the $A / USD. This suggests that the level of the $A / USD has been low when production is high, with a lower exchange rate assisting export competitiveness in times of high production. In contrast when the $A / USD has been high, production is low and the impact of decreased export competitiveness on the local price is not as great due to low supply conditions in the domestic market as well as a higher world price. Whether this is a coincidental relationship or a causal relationship would require further investigation.

The results from Table 8 (see Appendix) confirm the mixed nature of the correlation results. The variance from local mean price is greater than that of the world price, suggesting that the $A / USD does not act as an insulator to world price variances. An interesting result is that variance around the production mean is greater than variance around the local price mean, which could have wider implications for pricing management.

The results for the wheat data are mixed. The correlation between the world price and the local price suggests that the $A / USD does not act as an insulator for the local price to movements in the world price, rather that there is a strong correlation between the two prices. In addition there is a correlation between the $A / USD and annual production as well as production and the world price – perhaps both suggesting that local production has an indirect relationship with the local price (through the world price and $A / USD rather than directly to the local price).

Conclusions

At a macro level the Australian exchange rate has been considered by other studies as a commodity currency given the high proportion of commodity based exports in Australia's trade balance. However at the micro level of beef cattle, wool, and wheat this relationship is not as strong and the $A / USD does not insulate the local price to movements in the world price. Rather there is a significant relationship between the $A / USD and the local price. A surprising feature is that for wheat and wool, there is little relationship between the level of Australian production and the local price. Rather annual production of these commodities has a stronger correlation with the world price, which appears related to the $A / USD which then indirectly feeds to the local price. For farm managers in the wool and wheat sectors this is a confirmation that world price levels of these commodities are worth observing in relation to management decisions. The nature and strength of these relationships requires further investigation to establish if causal relationships exist and, if so, what is the strength of these relationships. The establishment of such causal relationships will help clarify the mixed results of the correlation relationships between the local price, world price, $A / USD and local production. These relationships would also benefit farm managers as they would assist establish the key determinants of the local price.

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Appendix

Table 1. Commodity Exports as a percentage of Total Exports (By Value)

	1982/83	1987/88	1992/93	1997/98	2002/03
Farm Commodities	18%	20%	21%	20%	18%
Resource Commodities	39%	39%	39%	36%	37%
Other Commodities	13%	10%	2%	2%	2%
Total Commodities	*70%*	*69%*	*62%*	*58%*	*57%*
Manufacturing	*13%*	*12%*	*12%*	*20%*	*22%*
Services	*17%*	*19%*	*22%*	*22%*	*21%*
Total Commodities	100%	100%	100%	100%	100%

Source ABS Year Book 1985, 1992, 1995, 1999, 2003

Table 2. Wheat, Beef Cattle, and Wool Exports as a Percentage the value of Total Exports

	1982/83	1987/88	1992/93	1997/98	2002/03
Beef Cattle	4.50%	3.90%	3.90%	2.40%	2.70%
Wool	6.90%	10.00%	3.90%	2.00%	2.20%
Wheat	5.40%	3.30%	2.60%	3.20%	2.10%
Total 3 Farm Commodities	*16.8%*	*17.2%*	*10.4%*	*7.6%*	*7.0%*
All Farm Commodities	18%	20%	21%	20%	18%

Source ABS Year Book 1985, 1992, 1995, 1999, 2003

Table 3. Correlation Results of Beef Cattle Local Price, World Price, $A / USD, and Australian Production on an annual basis since 1984

Beef	*Local Price*	*World Price*	*$A / USD*
Local Price	1		
World Price	0.18	1	
$A / USD	-0.74	0.31	1
Production	0.62	-0.29	-0.74

Table 4: Key Descriptive Statistics of Beef Cattle Local Price, World Price, $A / USD, and Australian Production on an annual basis since 1984

	Local Price	*World Price*	*$A / USD*	*Production*
	$A c / kg	US c / kg		kt
Mean	207	221	0.7080	1769
Standard Deviation	37	32	0.0950	245
Co-efficient of Variation	0.18	0.14	0.13	0.14

Table 5: Correlation Results of Wool Local Price, World Price, $A / USD, and Australian Production on an annual basis since 1984

Wool	*Local Price*	*World Price*	*$A / USD*
Local Price	1		
World Price	0.77	1	
$A / USD	-0.23	0.15	1
Production	0.01	0.26	0.55

Table 6: Key Descriptive Statistics of Wool Local Price, World Price, $A / USD, and Australian Production on an annual basis since 1984

	Local Price	*World Price*	*$A / USD*	*Production*
	$A c / kg	$A c / kg		Kt
Mean	437.02	282.39	0.7080	794
Standard Deviation	120.63	63.26	0.0950	147.5
Co-efficient of Variation	0.28	0.22	0.13	0.19

Table 7: Correlation Results of Wheat Local Price, World Price, $A / USD, and Australian Production on an annual basis since 1984

Wheat	*Local Price*	*World Price*	*$A / USD*
Local Price	1		
World Price	0.51	1	
$A / USD	-0.45	0.45	1
Production	0.08	-0.23	-0.26

Table 8: Key Descriptive Statistics of Wheat Local Price, World Price, $A / USD, and Australian Production on an annual basis since 1984

	Local Price	*World Price*	*$A / USD*	*Production*
	$A / t	USD / t		Mt
Mean	225	144	0.708	17.1
Standard Deviation	47	25	0.095	4.8
Co-efficient of Variation	0.21	0.18	0.13	0.28