On Price Dynamics in International Wheat Markets

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Abstract

Extending the previous work by Bessler et. al. (2003), this paper examines dynamic relationships in the international wheat markets by employing five different base (country) currencies and a basket of currency. The stable aggregate currency (SAC) is proposed as the basket currency to be used in examining wheat price dynamics as opposed to individual base currencies or other possible baskets. Employing directed acyclic graphs and standard moving average representations, we compare the results from the SAC currency to those from prices converted in five base currencies. The findings are dependent upon the base currency choice; however, in all cases Canada is the dominant power in affecting world wheat price, whereas, the price innovations pass through the U.S. and Australia to the rest of the world. Furthermore, Europe and Argentina are information "sinks" as they receive but do not transmit new information. A possible latent variable associated with wheat pricing in the European Union appears to mediate information flows between Europe and Argentina and between Europe and Australia. Given the stability and low correlation properties of SAC, it is proposed to use SAC when studying price dynamics across countries.

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Introduction

Our purpose is to explore questions of leadership in pricing of wheat from five countries (regions): Argentina, Australia, Canada, European Union, and the United States. Our focus is on exchange rate adjustments and robustness of results under differing exchange rate treatments. In particular we explore the use of the recent innovation of a Stable Aggregate Currency (SAC) and information flows embedded in differing wheat price quotes from each of the five regions listed above. In one way the paper is a redo of the 2003 *Journal of Regional Science* paper co-authored by the second author and two of his former graduate students. The justification for another look at this question of price discovery in world wheat markets is the SAC innovation and its obvious surface implications for international trade. We review the justification for a SAC-like numeraire, its calculation and results from its use in the wheat price discovery question. Implications for other work involving international trade will be offered at the conclusion.

In studying questions of contemporaneous and dynamic causality across international markets, there are factors, other than prices that may account for price leadership. Two possibilities are government regulations and transportation costs. Another possible factor that would affect the results and further implications is the base currency or measurement unit. When a study focuses on prices from various countries, it is important to choose a measurement unit that would not introduce additional variation or co-variation into the study, thus potentially confounding any leadership results. Accordingly, how can one decide on which currency to choose as a base? It is common to use the US dollar, apparently relying on the “fact” that it is relatively less variant as opposed to, say, the Argentine peso. It's not clear how such an argument extends to the use of say the Japanese Yen, the Australian dollar or the European Euro. Such ambiguity is apparently the reason for recent focus on a new currency basket, the stable aggregate currency or SAC. It was initially proposed by Hovanov et. al. (2003). They empirically demonstrate that SAC has the least variance and the least correlation with its individual currencies compare to Special Drawing Rights and other basket currencies. The feature of minimum variance is attractive and argues for its use as the base currency in studies of international trade.

The original paper of Bessler et. al. (2003) is revised to study the dynamics of the world wheat prices of Australia, Argentina, Canada, EU, and the U.S. using not only the SAC, but also other base currencies. This will enable us to compare results based on different base currencies. Unlike the original paper (Bessler et. al., 2003) which used U.S. dollar as a base currency, our paper considers results from wheat prices measured in five different currencies scenarios: the U.S. dollar (USD), the Australian dollar (AUD), respective local currencies (no exchange rates adjustments or local currencies), Special Drawing Rights (SDR) and the Stable Aggregate Currency (SAC).

The contribution of this paper is to help discover the incidence of price discovery in world wheat markets, with a better understanding of how results are or are not dependent on underlying currency measures.

Description of SAC

As introduced above, SAC is proposed in Hovanov et. al. (2003). It is constructed as a basket comprised of the key currencies that are given weights based on volatility. The optimal weights are obtained using the mean-variance framework as in Markowitz

(1959). Their findings suggest that SAC has the minimum variance both by design and in empirical fact. In order to construct the SAC, they first proposed the idea of invariant currency value index (ICVI) which is independent upon the choice of the base currency. In other words, regardless of the base currency choice the value of index of a currency will not change for any fixed set of currencies. In order to mathematically express the ICVI, Hovanov et. al. (2004) use normalized value in exchange or normalized index of value (*NVal)* in exchange:

$$Nval_{ij}(t) = \frac{C_{ij}(t)}{\sqrt[n]{\prod_{r=1}^{n} C_{rj}(t)}} \qquad (1)$$

where $Nval_{ij}(t)$ is the normalized value of a currency, $C_{ij}(t)$ is a rate of exchange of the i^{th} currency for the j^{th} currency at time *t*, and the j^{th} currency is the base currency. The denominator $\sqrt[n]{\prod_{r=1}^{n} C_{rj}(t)}$) is the geometric mean of values $C_{1j}(t),...,C_{5j}(t)$, where *n* is the number of currencies (i.e., equal to five in this study). Regardless of the base currency choice, the normalized value in exchange $NVal_{ij}$ is the same for each base currency chosen, therefore $NVal_{ij}$ can be substituted by $NVal_i$ for the rest of the study. The time series of all the currencies' wheat prices are observed employing $NVal_i$.

In this paper, we use several transformations to get the wheat prices in the desired form. The following equation is used to convert the wheat prices in their local currencies into that in numeraire by adjusting it with exchange rates of the particular currency for numeraire:

$$WP_{it}^{numeraire} = WP_{it}^{currency} \times \frac{numeraire_{t}}{currency_{it}} \qquad (2)$$

where $WP_{it}^{numeraire}$ is the *i*th country's wheat price measured in numeraire currency, $WP_{it}^{currency}$ is the wheat prices of the i^{th} market in the i^{th} currency, and the ratio $\frac{numeraire_t}{currency_{it}}$ is the rate of exchange of the individual local currencies (i.e., $currency_{it}$) in terms of the numeraire (i.e., $numeraire_t$) at time *t*, where $i = 1, \ldots, 5$ and the $t = 1, \ldots, 97$. Equation (2) can be transformed into the following logarithmic form:

$$\log WP_{it}^{numeraire} = \log WP_{it}^{currency} + \log \frac{numeraire_t}{currency_{it}} \quad (3)$$

In the literature, many researchers use one relatively more stable individual currency such as U.S. dollar as a measurement unit of wheat prices. However, no article uses a basket of currencies versus individual currencies as a measurement unit. Given the stability property of SAC, it is desired that all the countries' wheat prices be measured in one particular index that would not fluctuate and thus either overstate or understate the wheat price movements.

In order to better understand why SAC is the most desireable basket of currency or, in this case the measurement unit, it is useful to show how the risks associated price and exchange rate are mitigated via SAC. For that purpose, variance of logarithm wheat prices is calculated which can be shown as:

$$\begin{aligned} Var(\log WP_{it}^{numeraire}) &= Var(\log WP_{it}^{currency}) + Var(\log \frac{numeraire_t}{currency_{it}}) \\ &+ 2\operatorname{cov}(\log WP_{it}^{currency}, \log \frac{numeraire_t}{currency_{it}}) \end{aligned} \quad (4)$$

Equation (4) shows that variations in wheat prices are influenced by the local price risk through the first term and exchange rate risk through the second and the third term.

In this study, the following currencies are used to construct the value of SAC: Japanese yen, British pounds, Danish crone, Swiss frank, Hong Kong dollar, Australian Dollar, U.S. Dollar , Canadian Dollar and the Euro[1]. Also note, that Argentine peso is not included because of its high volatility over time.

Data and Background

Consistent with the original paper (Bessler et. al, 2003), monthly free on board (FOB) export price quotations in addition to the exchange rates for the selected countries (i.e. US, Argentina, Australia, Canada, and the European Union) are used in this paper. Specifications of wheat price series are identical to the original paper. The key difference of this study to the earlier version of it is that the exchange rates are taken into consideration while examining the wheat price relationships among the largest wheat exporting countries. For that purpose, five different exchange rates are employed to analyze the price behavior across five countries. The exchange rates are helpful tool to convert the price series into the designed measurement unit. The exchange rate data is the following: all the respective currencies of the selected countries (i.e. U.S. dollars, Argentine peso, Australian dollar, Canadian dollar, and the Euro/ECU) in terms of US dollar (USD), Australian dollar (AUD), Special Drawing Rights (SDR) and the Stable Aggregate Currency (SAC). Then, each of these exchange rates are used to from one measurement unit to another, which is to say the measurement units are derived from the exchange rates. Thus, the following five measurement units are used: USD, AUD, local currencies (for example, Australian wheat prices in Australian dollar and so on), SDR and SAC. The last two units represent baskets of currencies that allow incorporating

[1] Note that before the creation of Euro (1999), the European Currency Unit (ECU) is used, starting from January 1999, Euro has replaced the ECU.

major currencies in particular proportions to keep the basket relatively stable. The details on construction of the basket of currencies are provided in the Section 2.

The data sources for wheat prices are the same as in Bessler et. al (2003). Exchange rates are retrieved from different sources including Pacific Exchange Rate Services by University of British Columbia, International Financial Statistics published by International Monetary Fund, and the Federal Reserve Board for the period from July 1991 to December 2005 using monthly averages. Notice that European Union's Euro was in the money circulation starting from the January of 1999. Thus, the European Currency Unit (ECU) is used for period July 1991 to December 1998.

Plots of wheat prices in the above-mentioned measurement units are presented in Figure1 panels a, B, C and D; with panel representing prices in US dollars, panel b in Australian dollars, panel C in SDR and panel D in SAC units. The general pattern of plots are similar across each of the five countries and across the four different exchange rate treatments. Differences do however appear from viewing the plots. Wheat prices of all the markets fluctuate with smaller swings if the SDR if applied as a measurement unit of prices. The interpretation of the wheat price behavior is intricate in case of SAC as a measuring unit due to the incompatible scale. In all currency measures data are not cointegrated, even though there is a clear movement that appears to hold among each of the five country prices, regardless of the exchange rate. A five variable VAR with two lags in each equation is fit to these data.

Fixing outliers

Innovations from the VAR are most likely not-normall or even symmetric around zero (they may show skewness). Such non-symmetric distributions may perform less well in subsequent hypothesis testing, Thus some consideration ought to be given to the general shape of the innovation distributions. For this purpose, standardized residuals for each country are obtained using CATS in RATS (Hansen and Juselius) computer software. The number of data points detected as having outliers differs upon the choice of the measurement unit, although it is generally between 6 and 10. The outliers exist on different dates for each country, in general. However there are couple of outliers that happen on the same date in all country cases. One of the dates is April 1996 which, even looking at the Figures 6-10, is the date that the wheat prices spike up (increase) in all countries. Consequently, the fix of those data points detected with the outliers is important. The data points with an extreme value are treated according to Juselius (2003). In this study the data points with outliers are fixed by modification that is implemented by adding zero/one dummy variables for the data. Specifically, the variables that are above or below a 2.5 standard deviation range are modified by dummy variables that are set to equal to one and zero otherwise. Standardized residuals are recalculated with the introduced dummy variables.

Time series plots and histograms on standardized residuals for each country in case of each measuring units before and after inclusion of the zero/one dummy variable is presented in Figure 2. The data, after the inclusion of dummy variables as a control variable for outliers, evidences the fact that the range of standard deviation encompasses most of the data points and the standardized residuals demonstrate near normal distributions with few or no outlying values. Consequently, the data are used for further analysis.

Directed Graphs

As mentioned in the original paper, the study of contemporaneous price relationship in the international wheat market play very significant role for possible implications of price discovery. In addition, it is an important “input” for analyzing the dynamic causal relationship through VAR-type innovation accounting which is presented later in the paper.

A directed graph is a picture representing the causal relationship among a set of variables. Lines with arrowheads are used to represent causal flows, such that A→B indicates that variable A causes variable B. However, the causal direction is undetermined if we get A − B. D-separation, which formally represent the screening-off phenomenon, is used to assign the direction of causal flow to a set of variables (Pearl, 2000).[2] Spirtes et al. (1993) have incorporated d-separation into an algorithm (PC algorithm) for assigning casual flows among a set of variables or in other words, for building directed acyclic graphs (i.e. acyclic graph can contain only one of each variable) using the notion of sepset, which is defined as a variable that was conditioned on to remove edges between two variables. The PC algorithm is an ordered set of commands that remove edges from a complete undirected graph by first checking for any relationship between pairs of variables. The edges between variables with no correlations are removed. This checking process continues until all the possible relations among a set of variables are checked. After the first order conditional correlation, the checking process continues for zero second order correlation, and so on up to N-2 order conditional

[2] For more detailed information about Directed Graphs, we refer our readers the original paper by Bessler et.al (2003).

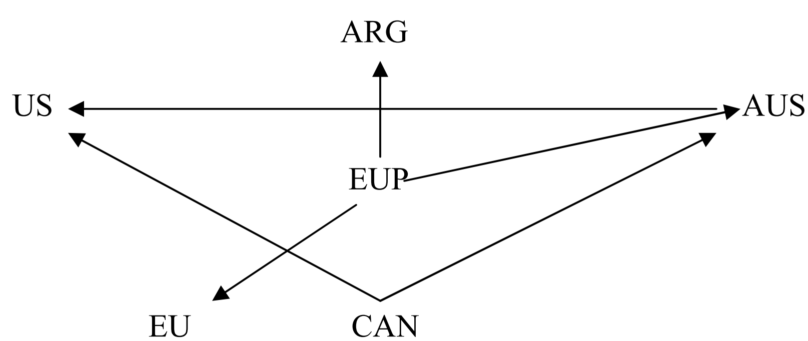
correlation. The PC algorithm is programmed in the software TETRAD II (Scheines et al., 1994).

The causal flows can be restricted based on the geographical location of countries which will direct the edges accounting for the causal restriction. However, no restriction is placed on the causal relationship among the countries under this study as it may leave out important causal facts. Based on Monte-Carlo estimation, level of significance differs depending on the number of observations. The number of observations for this study is less than 100, which, according to Monte Carlo estimates, should be analyzed by 20% significance level (Spirtes, Glymour and Scheines 2000).

The DAG results are presented in Figure 3 panels A, B, C, and D. based on the four different exchange rate treatments: US dollars, Australian dollars, SDR, and SAC. The three graphs based on the US dollar, Australian dollar and the SAC are identical. Canadian price innovations cause innovations in the Australian price, which in turn causes innovations in the US price. There is a direct edge between Canadian innovations and US innovations, which cannot be assigned direction; however, if we maintain a directed acyclic graph posture, the edge must be assigned as Canada causes US; otherwise we would induce a cycle: US causes Canada, which in turn causes Australia which in turn causes US,; so one would end up back where she/he started.

Furthermore, all graphs find the possibility of omitted variable between Argentina and the European Union (the bi-directed edge in all four panels suggests that there may be an additional variable (say the Union import price) which may well mediate between Argentina export price and European export price. A similar result appear to be present in the Australian innovations and European Union innovations, as here we see the bi-directed edge in panels A, B, and D.

If we maintain the directed acyclic graph posture and thus have Canada leading the US in contemporaneous time, then Canada is the information root cause: US, Argentina and Australia are all influenced directly or through intermediaries by Canada, with no feedback (in contemporaneous time). Argentina and the European Union become candidates for the role of information sinks. If an omitted variable sits between Argentina and the EU and between Australia and the EU, then that omitted variable is itself a root cause, along with Canada. [The presence of bi-directed edges suggests an omitted variable.] If this omitted variable is the EU policy price, which we label in the following figure as EUP, then it takes two information sources, innovations in Canada (CAN) and innovations in the European Union policy price (EUP) to understand (to be able to reach) innovations in all other markets: Argentina, European Union, Australia and the US.



Canada is exogenous in the international wheat market due to the fact that the shocks in its own prices are transmitted to other largest wheat exporting countries and it is not caused by innovations of any other market's wheat prices. The U.S. and Australia participate in both receiving and transmitting the price innovations in the world. Argentina appears to only receive price innovations information.

Innovation Accounting

Based on the directed graphs given in Figure 3 we offer impulse response functions for one-time-only positive shocks (one standard deviation of historical innovations in each case) in information from each country in Figure 4. Here we standardize responses, so that it is easy to compare across sub-graphs. [The reader isn't asked to try to see or recover the axis labels in each sub-figure, only to note the direction and relative magnitude of each response (relative to other subplots). The horizontal axis in each axis is time periods (in months) following the information shock (innovation). Thirty six periods (three years) are listed on each sub-figure. The vertical axis are the standardized responses (each response of series i to a shock in series j is divided by the historical standard error of series i). The axis ranges from -1.5 to +2.5 in each sub-graph.] We give four panels on each set of responses: panel A gives results for all prices expressed in US dollars, panel B gives results for prices in Australian dollars, panel C for prices expressed in SDR and panel D prices in SAC currency. The overall result is that responses do not vary much by exchange rate treatment. Each subplot in panel a for example looks similar to its corresponding sub-plot in panel B, C, and D. Across all panels and sub-plots in each panel, Canada appears to generate the largest positive response (look down the column labeled innovation to CAN in any sub-graph of any panel). The US also generates consistently strong positive responses from all other countries, except Canada. New information originating in Australia also finds its way into other countries price series, save Canada. Australia appears to be particularly influential on pricing in the European Union. A similar statement holds for responses to information originating in the Argentine.

The visual offerings in Figure 3 can be given a bit stronger footing if we look at the forecast error variance decomposition. These are offered in tables 1 and 2. [Uncertainty in each countries price series at any future horizon can be decomposed into information components (new information) originating in itself and other countries. For example the Australian export price in US dollars at 24 month ahead, is explained in the decomposition given under the Australian panel in Table 1: 12.23% of the Australian price uncertainty is attributable to information arising in Argentina, 40.60 % due to current and earlier information arising in Australia itself, 15.86% from price information first arising in Canada, 14.96% from information arising first in the European price and 16.35% from US information. Similar interpretation hold for every country at each horizon listed 0, 1, 6, 12 and 24 months ahead.] Our point of contrast is between the decompositions in table 1 (US $) and table 2, which are decompositions for prices measured in SAC units.

Several points of discrepancy are seen between the two tables. First for Australia, when using US $ as the numeriare, Canada appears to less influential on Australian price compared to its influence on Australian price when measured in SAC unite (at a 24 month horizon Canada influence on Australian price uncertainty is 15.86% when measures are in US dollars compared to 25.32% in SAC units a difference approaching 10%). Further, Australia is marginally more exogenous (if that's possible, sort of being marginally more pregnant) when price is measured in SAC relative to US dollars (at say

24 months SAC measures have Australia accounting for 51.01% of its own uncertainty; while US $ measure has 40.60% due to earlier innovations in Australian price).

Other noticeable differences in the two tables, are Canada's stronger role as an exogenous force in wheat pricing under SAC units (89.36% at 24 months ahead) relative to US dollars (73.53%). In both tables Canadian price is clearly the most exogenous series, but the SAC measure show it to be influenced by other countries to a very small degree. Interesting Australia is an important player in the European price in both tables, but considerably more influential when SAC measures are used (44.66% in SAC versus 34.78% in US $ at 24 months ahead). Finally, the US decompositions appear to be similar under each table, with Europe showing a slightly greater influence on US prices when US dollars are used (table 1) and Australia shows less influence on US prices (when US dollars are used).

Conclusions

Here we have studied price discovery in export wheat from five countries: Australia, Argentina, Canada, European Union and the U.S. We used data measured monthly over the period 1981 – 1999. At a basic level the paper is a re-look at the same data using similar methods as Bessler, Yang and Wongcharupan (2003). What is different in this paper is we consider basket currencies, in particular the Stable Aggregate Currency (SAC), recently proposed by Hovanov et al. (2003). We compare results from measuring in SAC with results from using Australian dollars, US dollars and the SDR (Special Drawing Rights) units. In one sense our results are comforting, as we find similar results under all exchange rate treatments. Our DAG results are quite similar under all exchange rate treatments in that we find considerable evidence Canada is an information root; that

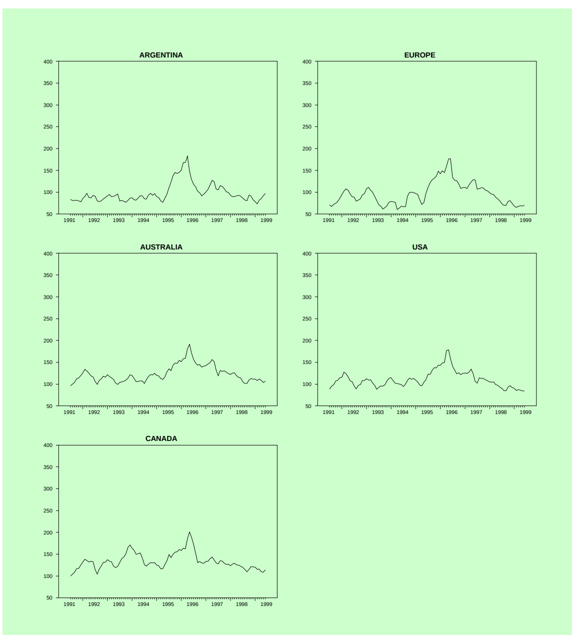
Australia and the US are mediating causes (middle nodes in causal chains); and Argentina and Europe are causal sinks (receiving but not passing on any contemporaneous information). Further we found evidence that an omitted variable may exist between the European Union and its two connected pricing partners, Australia and Argentina. We explain this finding by postulating the non-trivial casual difference between the Europe import prices and domestic prices found in European policy. Impulse responses from the four differing exchange rate treatment are virtually identical – at least in terms of direction of responses to information shocks originating in each country. These may be a slightly more volatile response pattern communicated when prices are measured in US dollars, compared to the other exchange rate treatments (Australian dollars, SDR's and SAC units).

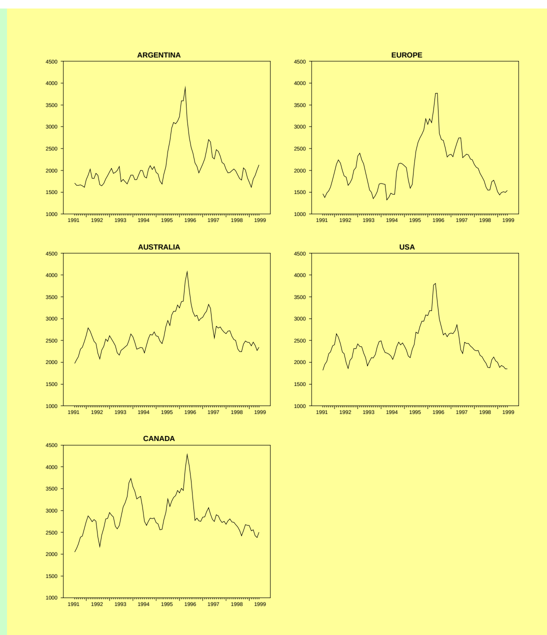
Differences are noted for relative strength of relationships in forecast error variance decompositions among the five price series by differing exchange rate treatments. Under all treatments, Canada is the world leader in wheat pricing, as its forecast error variance from 0 to 24 months ahead is primarily explained (accounted for) by innovations (information) arising (first seen) in the Canadian price. Canadian dominance shows itself to be stronger when SAC is used as the exchange rate metric relative to using the US dollar (or other currencies Australian dollar, etc). In the long run (24 months) Australia is more strongly influenced by Canada when the SAC measure is used, than when US dollars are used as units. And finally under SAC measures, Australia has a strong influence on the European price, relative measures with the US dollar.

Further research on the actual SAC calculation under non-stationarity of the underlying exchange rates is one obvious new direction to be considered. Here SAC is computed based on variance and co-variances without taking into account time series properties of each base currency. Most currencies are non-stationary. It would be preferable to re-think the SAC calculations when proper stationary inducing transformations (differences) have been carried-out**.**

Transportation costs have not been included here. Augmenting the five variable VAR (or ECM) to include transportation costs, also measured in SAC, would be interesting and a priori sensible.

Panel A: U.S. Dollars **Panel B: Australian Dollars**





Panel C: SDR **Panel D: SAC**

Figure 1. Plots of Historical Data on World Wheat Prices in US Dollars, Australian Dollars, SDR and SAC Measures, 1991-1999.

In all cases the y-axis represents units per ton, the x-axis is time in months and years,

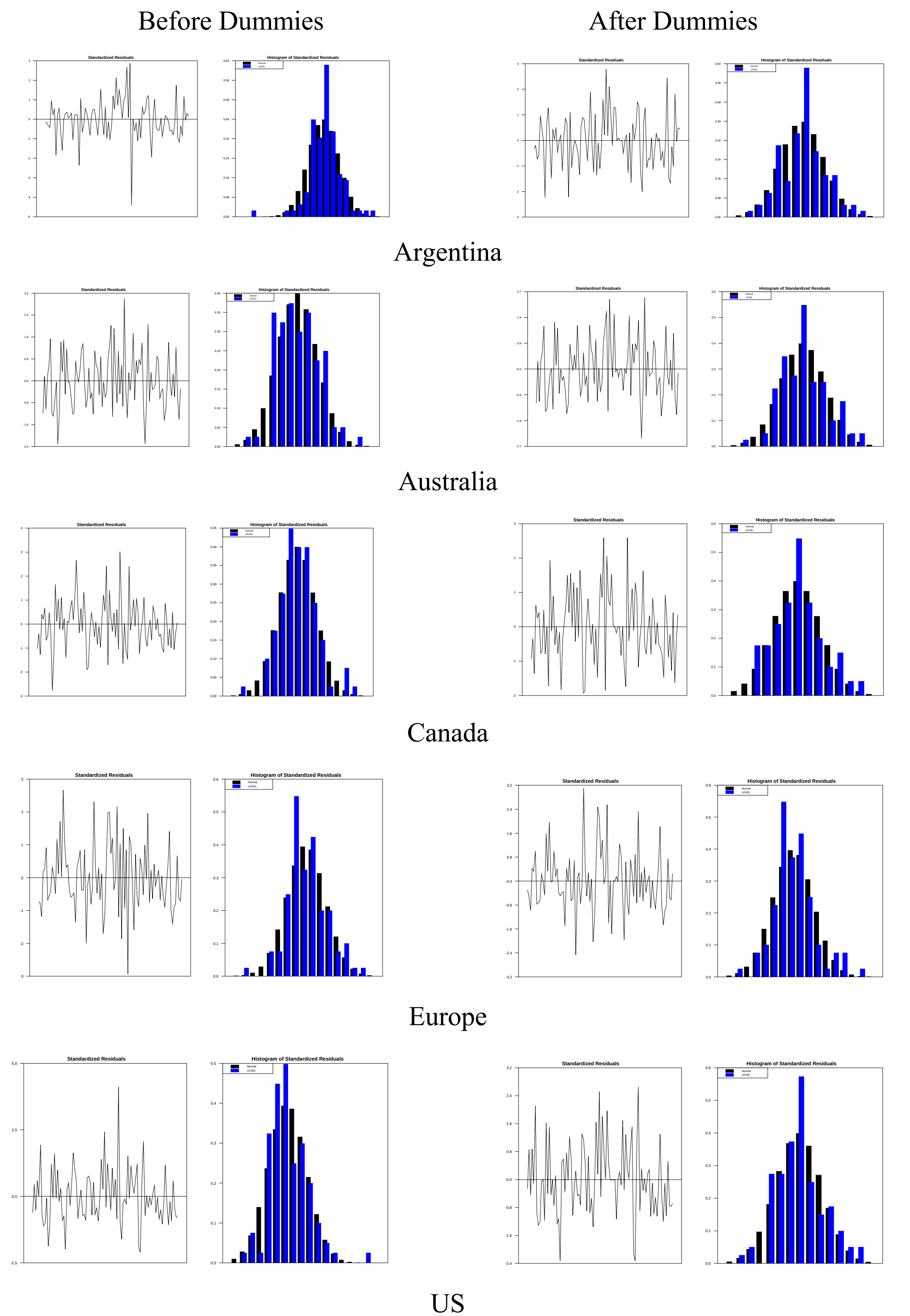
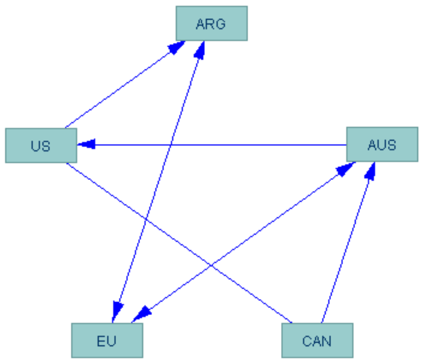
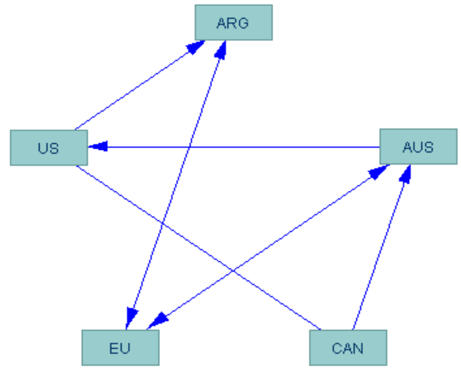


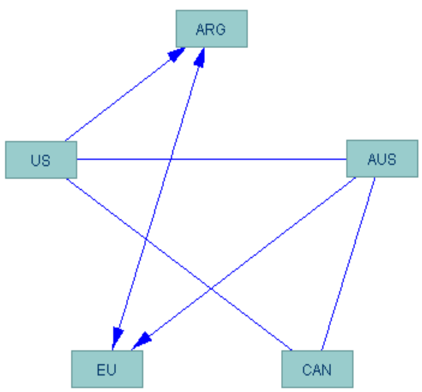
Figure 2. Time Series Plots and Histograms on Standardized Residual By Country Before and After Zero/One Dummy Variables Added for Outliers (all the wheat prices are in SAC).



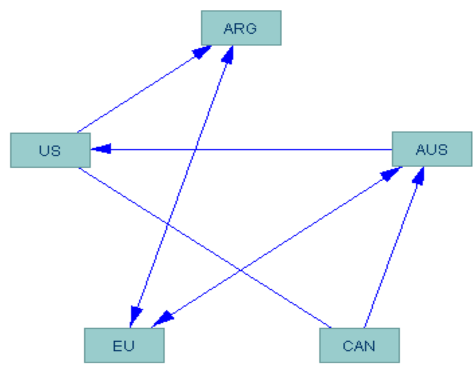
Panel A:Pattern in USD



Panel B: Pattern in AUD

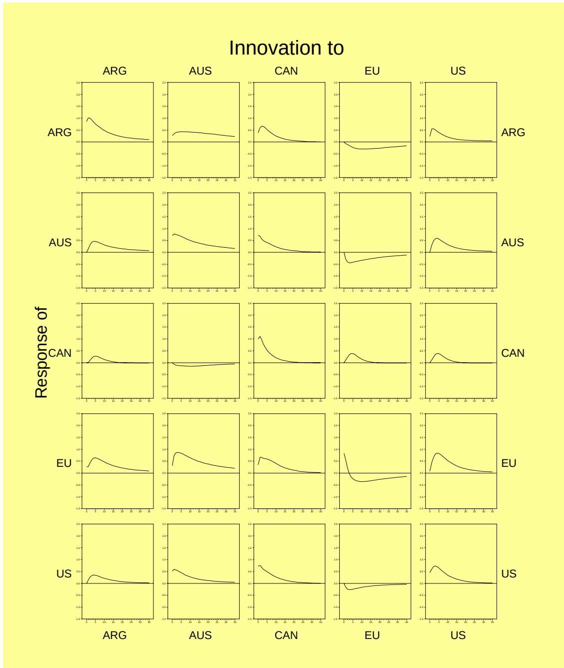


Panel C: Pattern in SDR



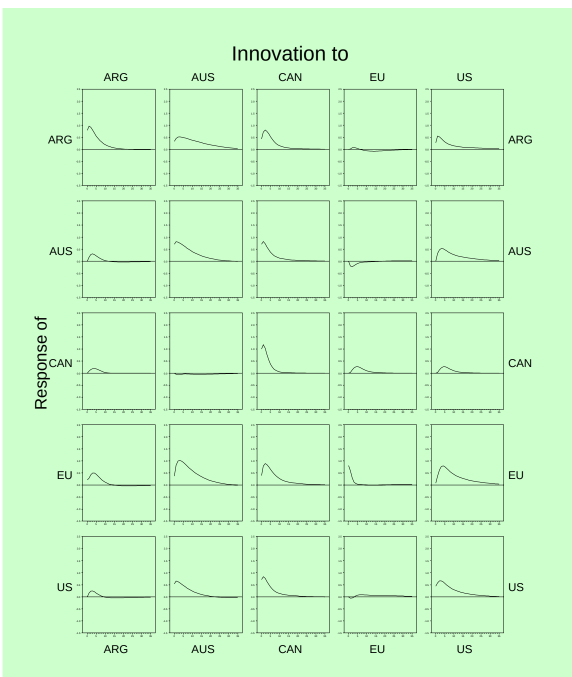
Panel D: Pattern in SAC

Figure 3. Patterns on Innovations from VARs on Different Exchange Rates.

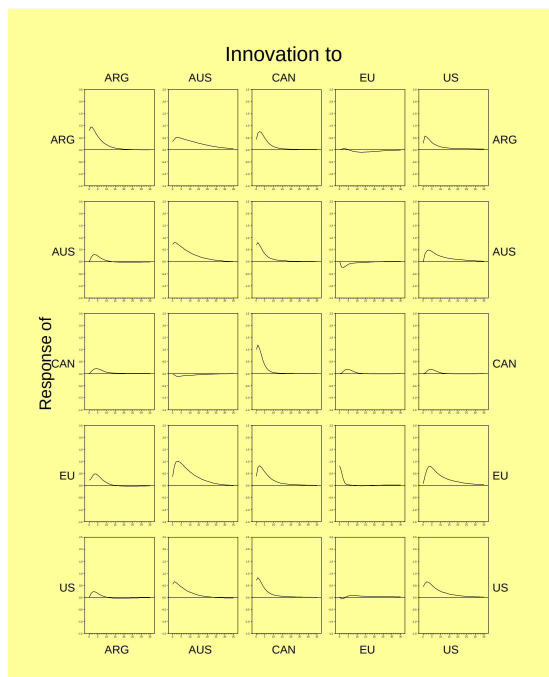


Panel A: US Dollars

Panel B: Australian Dollars



Panel C: SDR



Panel D: SAC

Figure 4. Impulse Responses by Differing Exchange Rate Metrics.

Table 1. Forecast Error Variance Decomposition of Wheat Price from Five Markets Based on Bernanke Decomposition; All prices are measured in US Dollars.

USD based

Horizon	Argentina	Australia	Canada	Europe	U.S.
			Argentina		
0	72.29	7.36	14.72	0.00	5.62
1	62.18	6.75	17.91	0.21	12.95
6	52.33	10.43	21.42	1.97	13.85
12	48.97	14.82	18.97	4.97	12.27
24	44.09	20.75	15.82	8.88	10.46
			Australia		
0	0.00	48.91	51.09	0.00	0.00
1	0.81	48.24	43.01	3.81	4.14
6	10.14	38.92	22.50	10.90	17.57
12	11.99	38.90	18.40	12.92	17.80
24	12.23	40.60	15.86	14.96	16.35
			Canada		
0	0.00	0.00	100.00	0.00	0.00
1	0.00	0.19	98.67	0.60	0.53
6	4.57	1.42	81.91	1.78	10.31
12	6.27	2.92	76.83	1.82	12.16
24	6.17	5.62	73.53	2.97	11.70
			Europe		
0	6.78	9.80	12.43	70.46	0.53
1	5.50	25.00	22.19	39.65	7.67
6	14.09	32.41	18.80	9.43	25.28
12	15.70	32.81	17.00	9.39	25.09
24	15.75	34.78	15.10	11.43	22.94
			U.S.		
0	0.00	26.57	53.13	0.00	20.30
1	0.78	26.71	47.19	1.05	24.27
6	6.74	22.35	32.01	3.99	34.92
12	8.21	22.08	29.56	4.75	35.40
24	8.64	22.61	28.56	5.35	34.84

Table 2. Forecast Error Variance Decomposition of Wheat Price from Five Markets Based on Bernanke Decomposition; All prices are measured in Stable Aggregate Currency (SAC).

SAC Exchange Metric					
Horizon	**Argentina**	**Australia**	**Canada**	**Europe**	**U.S.**
			Argentina		
0	62.86	11.15	18.50	0.00	7.49
1	52.82	10.72	22.67	0.00	13.79
6	43.18	16.62	27.21	0.06	12.93
12	40.24	22.23	24.93	0.43	12.17
24	37.86	25.95	23.40	1.05	11.74
			Australia		
0	0.00	51.01	48.99	0.00	0.00
1	0.96	47.12	45.87	1.92	4.13
6	4.79	46.96	30.85	2.59	13.81
12	4.38	50.13	26.63	2.32	16.54
24	4.17	51.01	25.32	2.24	17.26
			Canada		
0	0.00	0.00	100.00	0.00	0.00
1	0.22	0.14	99.62	0.02	0.00
6	3.63	1.13	92.59	0.31	2.35
12	4.42	1.77	89.85	1.19	2.78
24	4.44	2.09	89.36	1.33	2.77
			Europe		
0	4.79	13.37	14.96	66.31	0.57
1	4.42	28.60	25.25	36.07	5.67
6	7.94	40.09	22.11	8.27	21.60
12	7.05	43.60	19.28	6.31	23.76
24	6.62	44.66	18.29	5.89	24.54
			U.S.		
0	0.00	30.03	49.81	0.00	20.16
1	0.96	29.90	47.57	0.12	21.45
6	3.25	29.11	36.34	0.25	31.06
12	2.96	29.91	33.15	0.60	33.39
24	2.97	29.66	32.33	0.87	34.18

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