VOLATILITY SPILL-OVER IN A CUSTOMS UNION: THE CASE OF SOUTH AFRICA SHEEP IMPORT FROM NAMIBIA

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Oyewumi, Olubukola A. and Sarker, Rakhal

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Olubukola A. Oyewumi and Rakhal Sarker[1].

Abstract

Prices guide economic agents' resource allocation and output mix decisions. The extent of price transmission determines the nature of market integration. Volatility spill-over in spatially linked agricultural markets has been investigated, but not across borders. We developed an E-GARCH model which enabled us to explore various properties of price volatility – volatility persistence, asymmetric interference and volatility spill-over. We found the existence of significant volatility spill-over within the South African Customs Union (SACU) using sheep price data in Namibia and South Africa, especially with the introduction of Small Livestock Marketing Scheme (SLMS) in namibia. The results show more stickiness in the retail market than the wholesale market in South Africa (90% and 49%), suggesting a greater impact of price volatility on South Africa consumers than the processors. In terms of volatility spill-over, the asymmetric effect is significant at 5 percent suggesting that these two markets are somewhat integrated, since the incidence of volatility spill-over from Namibia has influenced price information transmission in the South African sheep market. Furthermore, 79 percent of the volatility in the Namibian market is transmitted through sheep meat retail prices to the South African sheep market. The measure of volatility persistence is significant; indicating that 45 percent of the volatility transmitted to the South African sheep market is persistent.

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[1] Respectively PhD student and Associate Professor, Department of Food Agricultural and Resource Economics, University of Guelph, Ontario Canada. Corresponding author: ooyewumi@uoguelph.ca

INTRODUCTION

Prices guide economic agents' resource allocation and output mix decisions. The extent of price transmission determines the nature of market integration. Transmission of price volatility in vertically or horizontally linked markets has received considerable attention in agricultural economics. Volatility spillovers in financial markets and commodity markets have been well documented (Gallagher and Twomey, 1998; Goodwin and Holt, 1999; Apergis and Rezitis, 2003; Buguk, Hudson and Hanson, 2003; Meyer and von Cramon-Taubadel, 2004 and Frey and Manera, 2007). We have found no study conducted in agricultural economics literature which explored the extent of volatility transmission in a Customs Union and its implications. The primary objective is to bridge this gap in the existing literature using the South African Customs Union (SACU) as a case study.

SACU was originally established on June 29, 1910 with four members, the Republic of South Africa, Botswana, Lesotho, and Swaziland. This makes it the oldest Customs Union in the world. After Botswana, Lesotho and Swaziland gained independence in mid 1960s, they renegotiated the agreement with the apartheid government of South Africa in 1969. This agreement included a revenue-sharing formula to divide customs and excise revenue collected in the union among its members. The BLS received a significant share of their govt. revenue through this formula. Namibia was a *de facto* member of SACU from 1910 as it was a part of South Africa known as Western Africa. However, after independence, Namibia became a member of SACU formally in 1990. After the formation of the first South African govt. of national unity, South Africa and BLNS initiated formal negotiations for a new SACU in November 1994. After more than eight years of on-off negotiations, the new SACU emerged with a new revenue-sharing formula, new institutional details and governance structure. The agreement was signed in October 2002.

Table 1: Structural characteristics of SACU Member States (2004)

	RSA	*Botswana*	*Lesotho*	*Namibia*	*Swaziland*
Area (sq. km)	1,221,040	566,730	30.350	823,290	17,200
Population (million)	43.031	1.571	1.860	1.950	1.161
GDP ($m current)	212,777	8,974	1,312	5,712	2,396
GDP/capita	4944.74	5712.28	705.38	2929.23	2063.74
Share of Agriculture (%)	3	3	18	10	13
Share of industry (%)	32	51	41	32	47
Share of manufacturing (%)	20	5	19	14	39
Share of services (%)	65	47	42	58	40

Source: World Development Indicators (2006); Penn World Tables 6.2

Historically, South Africa has been the dominant member of SACU due to its economic size and geographical advantage. Despite sharing common trade and industrial policy, the economic management and the overall performance of BLNS countries differ markedly from each other and from South Africa (Table 1). The new SACU agreement contains 51 Articles and is more comprehensive than the earlier agreements. A new Article (#29) allows each member state to impose marketing regulations for agricultural products provided such that regulations do not restrict free trade of agricultural products between member states. The Namibian government took advantage of Article (29) and introduced the Small Livestock Marketing Scheme (SLMS) in July, 2004 to increase employment and to improve meat prices. While the SLMS did not reduce the demand for Namibian live sheep in South Africa, it contributed to increased price volatility of sheep and sheep meat in Namibia.

In terms of sheep trade between Namibia and South Africa, about 80% of total sheep raised in Namibia is exported on hoofs to South Africa for slaughtering in South Africa’s abattoirs. However, the SLMS required farmers to slaughter one animal for each sheep to be exported to South Africa in 2004. This ratio was increased to 2:1 in 2005 and to 6:1 in September 2006. This has led to a growing concern, especially in South Africa regarding the extent to which the effects of SLMS in Namibia are spilled-over to the sheep market in South Africa. No known study has been conducted to answer this question. An attempt is made in this paper to address this question by estimating an exponential generalized conditional heteroskedasticity (EGARCH) model.

VOLATILITY SPILL-OVER IN AGRICULTURAL MARKETS

The existence of volatility spill-over across vertically linked agricultural markets is documented in literature (Natcher and Weaver, 1999; Buguk, et al., 2003; Rezitis A (2003)). However, none of these studies considered markets that are linked across borders. Whereas, volatility transmission has been recorded in financial markets separated by borders (e.g. Asapergis and Rezitis, 2001; Reyes, 2001), it has not been widely researched in agriculture. Haigh and Bryant (2001) analysed the effects of ocean freight price volatility in international grain markets; however the price risk analysed was not transmitted across borders.

Other studies have analyzed the effects of volatility and allied risks on agri-food trade (e.g. Sarker and Villanueva, 2007); but none of these studies have applied to South African data. The motivation for this study is the need to fill the vacuum in literature regarding the presence of volatility spill-over from Namibia into the South African sheep market and to analyze the nature of volatility spill-over induced by the SLMS in Namibia. The study will answer the following empirical questions:

- How has the renegotiated SACU agreement and the introduction of SLMS in Namibia influenced volatility in its sheep market?
- Is there a spillover effect from SLMS in Namibia to South Africa’s sheep market?
- What is the extent of volatility spillover from the Namibian sheep market to the sheep market in South Africa?
- How can the results help to make informed policy choices in member states and in SACU?

DATA PROPERTIES AND ECONOMETRIC ISSUES

Price volatility and price transmission between the Namibian and the South African slaughtered sheep markets is analyzed using monthly time series on producer price of sheep in Namibia and the monthly retail price of sheep meat in South Africa. Producer price of sheep in Namibia was obtained from the Namibia Meat Board while retail price and wholesale price in South Africa was obtained from Statistics South Africa and the National Department of Agriculture. All three series were taken from January 2000 to March 2008.

Table 1: Data properties and descriptive statistics

	Retail price	**Wholesale price**	**Producer price**
Mean	3.4209	3.0753	1.7365
Variance	0.0592	0.0587	0.0591
Skewness	0.1099	0.0607	0.2936
Kurtosis	1.8959	1.8921	3.1189
Jacque-Bera	5.2282	5.1244	1.480
	(0.073)	(0.077)	(0.4771)

Figure 1 show there was a sharp drop in the number of sheep trade between South Africa and Namibia immediately after the SLMS was introduced in July 2004. However this was not sustained probably due to the periodic removal of quota by the Namibian government. While all price series are positively skewed, normality is rejected based on Jarque-Bera statistics at 10 per cent level of significance for both the retail price and wholesale price of sheep meat in South Africa, indicating that the price series is positively skewed and leptokurtic (rather than normally distributed). However, normality cannot be rejected for producer price of sheep in Namibia.

Two issues need to be addressed prior to the specification of the EGARCH model.

- It is necessary to investigate the time-series properties of the data.

- Determine the existence of "seasonality" in the volatility.

We followed the Box-Jenkins method (Box & Jenkins, 1970; Pesaran & Perasan, 1997) to deal with the first issue and Augmented Dickey Fuller test (Aspergis and Rezitis, 2003) to resolve the second issue. We employed a univariate specification which includes a constant and a time trend and the ADF test to determine time series properties as well as seasonality of the data. Based on the test results, an Exponential GARCH model was formulated.

Table 2: ARCH-LM test results

Prices	**F-statistic**	**Probability**
SAretail (ARCH,1)	6.3716	0.01327*
SAproces(ARCH,1)	10.4588	0.00024*
NAMprod (ARCH,1)	17.3768	0.00007*

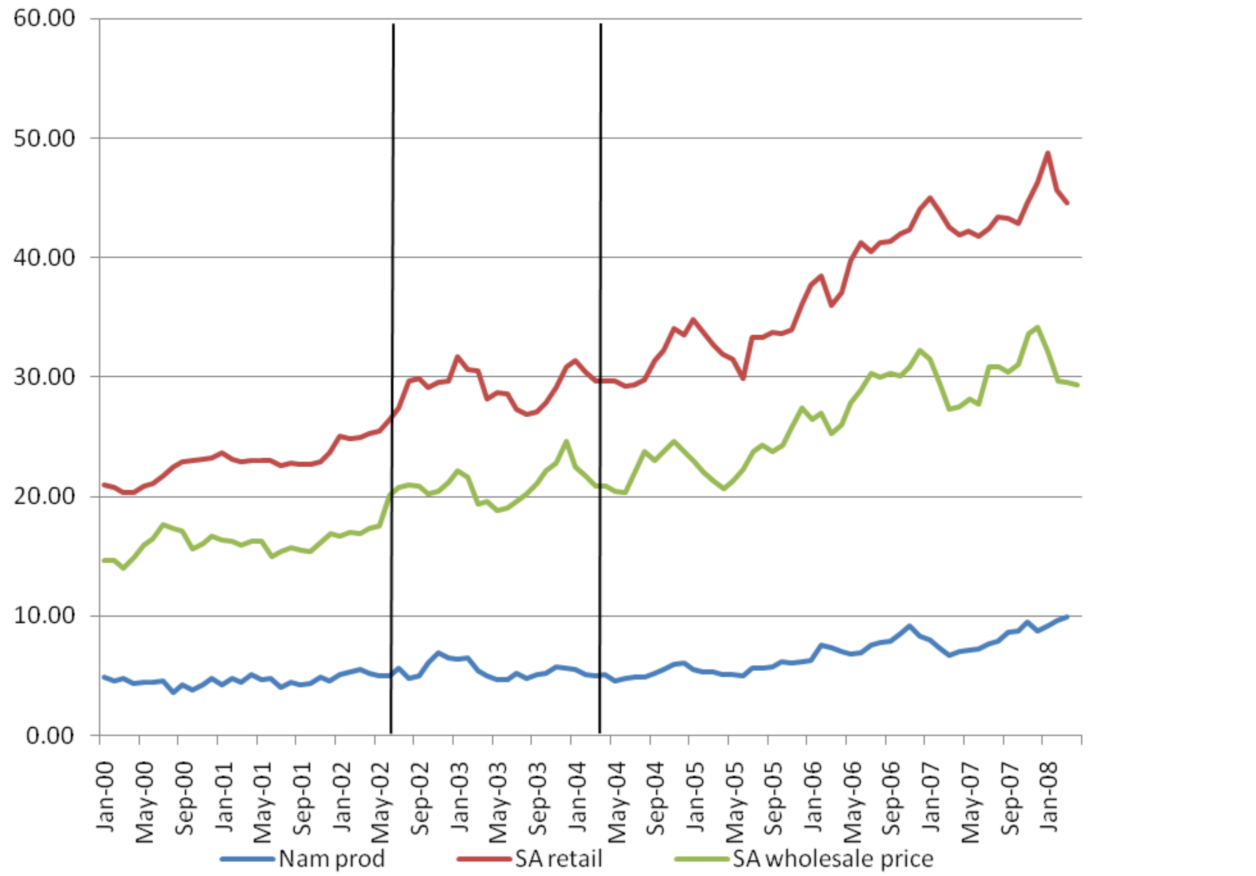
****Reject null hypothesis of no ARCH effect at 1or 5 percent level of significant, indicating time-varying volatility.***

Seasonality

Various studies have argued on the appropriateness or otherwise of using seasonally adjusted data for analyzing volatility (e.g. Aspergis and Rezitis, 2003; Kostov and McErlean, 2004). The argument bothers on whether the data would exhibit some level of bias if seasonally adjusted. It was confirmed that there could be some bias if data is seasonally adjusted, and this may reduce the strength of stationarity tests e.g. Augmented Dickey Fuller test (Aspergis and Rezitis, 2003). However, it is still important to understand the pattern and properties of the data to be used. We hypothesize that there may be seasonal trend in the pattern in the two time series used for this study. We therefore tested for the presence of seasonal effects independently for the two series using sixth and twelfth months as base periods. When dummy variables representing other months were regressed against each of the price series successively, no evidence of seasonality as all the dummy variables were not significantly different from the base periods. We therefore rejected the null hypothesis of presence of seasonal patterns. However, when the two time series were tested for time trend, they were all found to be time-trended.

Furthermore, using coefficient of variation (CV) we established that there was increased volatility in the price series prior to and after the introduction of the SLMS on the one hand, and the new SACU agreement on the other hand. As shown in Figure 2, the CV for producer price of sheep in Namibia increased from 9.74% to 22.19% after SACU was re-negotiated. For the retail and wholesale prices of sheep in South Africa, volatility increased from 9.88% to 17.40%, and 10.57% to 17.02% respectively. With the introduction of SLMS, the CV for producer price of sheep in Namibia increased from 13.3% to 20.55%. For retail and wholesale prices of sheep in South Africa, the CV increased from 13.43% to 33.72%, and 14.51% to 37.05% respectively. Thus, price volatility increased substantially in both markets after the introduction of the SLMS in Namibia.

Figure 2: Volatility in Sheep prices in South Africa and Namibia



E-GARCH MODEL OF VOLATILITY SPILL-OVER

Recent empirical studies on volatility modelling have relied on the GARCH model developed by Bollerslev (1986). This approach has been used to explain price volatility in agricultural markets (Apergis and Rezitis, 2004). Nelson (1991) improved on the work of Bollerslev (1986) by specifying an exponential GARCH model that allows for explaining the asymmetric effect of exogenous shocks on volatilities, as well as excluding the nonnegativity constraint on the coefficients of GARCH parameters. A variant of the EGARCH model developed by Nelson (1991) was used in this study. The specification allows for capturing both the spill-over and asymmetry effects on volatilities.

Two issues need to be addressed before analyzing the volatility spill-over effects. Firstly, the time series properties of the data must be explored in order to avoid using non-stationary series in the empirical analyses. This was done using a univariate specification augmented Dickey-Fuller (ADF) and the Phillips-Peron tests. The three series were logged and both tests confirm that all price series are time-trended. However, the producer price and wholesale price series are stationary at levels, i.e. I(0) while the retail price series had to be differenced once to make it stationary i.e. it is I(1).

Secondly, in order to appropriately specify the an EGARCH model, the Box-Jenkins methodology (Box & Jenkins, 1976) was used to determine the lag lengths *p and q* (Maddala and Kim, 1998) required for the specification of an EGARCH (*p,q)* model. For this study, we modelled the mean and variance equations as follows:

$$y_t = \alpha_0 + \sum_{i=1}^{n} \phi_p y_{(t-i)} + D + \varepsilon_t \qquad (1)$$

$$\varepsilon_t \approx N(0, \sigma_t^2)$$

$$\log(\sigma^2) = \exp\left(\alpha_0 + \sum_{i=1}^{p} b_i \log(\sigma_{t-1}^2) + \sum_{i=1}^{q} \alpha_i \eta_{t-i} \right) \qquad (2)$$

$$\eta_t = \sum_{i=1}^{p} \theta_i \left| \frac{\eta_{t-i}}{\sigma_{t-i}} \right| + \sum_{i=1}^{k} \lambda_k \frac{\eta_{t-k}}{\sigma_{t-k}} \qquad (3)$$

Equation 1 is the conditional mean equation (specified as an autoregressive process of order n), where y_t represents the logged price series, D is the deterministic trend variable and ε_t is the residual term. Having determined p *and q*, we are able to specify an EGARCH (*p,q)* model, the conditional variance equation as in equation 2. The EGARCH (*p*,*q*) represented by (2) shows that the variance is conditional upon its own past values, as well as the standardized residuals η_t $(= \varepsilon_t / \sigma_t)$. An important aspect of this specification is that it allows for capturing the level of persistence in volatility, which is a measure of market efficiency (Buguk, et al, 2003). The persistence in volatility is represented by the co-efficient $\sum_{i=1}^{p} b_i$ (Engle and Bollerslev, 1986). This absolute value of this sum determines whether volatility is persistent or dissipates after a shock. Volatility is closer to 0 in absolute terms, the less persistent volatility is, and closer to 1 in absolute terms[2].

The two components in Equation 4 can be explained as follows: the first term $\sum_{i=1}^{p} \theta_i \left| \frac{\eta_{t-i}}{\sigma_{t-i}} \right|$ denotes the ARCH effect. The coefficient λ in the second term captures the presence of asymmetric effect in the GARCH model. A statistically significant λ confirms the presence of asymmetric effect. The asymmetric effect of shocks on volatility can be explained when $-1 < \lambda < 0$, since then, a negative shock increases volatility more than a positive shock (Buguk et al, 2003). Political intervention is considered one of the major causes of asymmetric price transmission (APT). APT is bound to appear when the impact of a shock on the farm-retail price spread is predominant in one market than the other (Meyer and Von Cramon-Taubadel, 2004). In this case, there could be a case of asymmetry if the supply shift created by the introduction of the SLMS is greater than the demand shift or vice versa. Since we are examining spatially separated markets, where one has other sources of imports of meat and the other relies solely on its partner as its export destination, we will expect some degree of asymmetric price transmission.

The EGARCH model is built such that it can account for spatial volatility spill-over effect from the supply of sheep in Namibia to the South African retail market. We assume a unidirectional spill-over effect since Namibia only export sheep to South Africa and does not import either animal or processed meat from South Africa. In capturing volatility spill-over effect, we followed

[2] In an efficient market, it is expected that volatility will quickly dissipate after a shock without much persistence. Persistence of volatility is important for all market agents since it increases the impact of volatility on decision making. If volatility is persistent, it increases the level of exposure to risk and uncertainty.

the approach used by Buguk et al. (2003). We introduced the sum of square residuals from the mean-conditional variance equation of sheep process in Namibia as an exogenous variable for the conditional variance equations for sheep retail prices in South Africa. Therefore, the conditional variance equation for retail-level sheep prices is given as:

$$log\left(\sigma^2_{ret,t}\right) = exp\left[\alpha_0 + \alpha_1\left(z_{ret,t-1}\right) + blog\left(\sigma^2_{ret,t-1}\right) + c\left(U_{prod,t}\right)\right] \quad (4)$$

where $U_{prodt,t}$ is the squared residuals from the AR (2) EGARCH (*1,1*) model for producer sheep prices in Namibia, $z_{rat,t-1}$ is the lagged standardized residuals for retail price of sheep in South Africa. Existence of volatility spill-over is indicated by the statistical significance of c. For the wholesale-level, the conditional variance equation is similar to equation (4) above, with wholesale replacing the retail variance and lagged standard residuals. E-views allows for user-specification of the distribution of the error term. Since it is envisaged that there will be possible violation of the normality assumption of the error term (i.e. series with fatter or thinner tails than the normal density), the generalized error distribution (GED) based on Nelson (1991) was specified. For any random variable (X_t) to be said to have a GED with zero mean, constant variance and a tail parameter v, such variable must satisfy the following condition:

$$g(X_t) = \frac{v exp\left[-(1/2)|X^t/\phi|^v\right]}{\phi 2^{(v+1)/v}\Gamma(1/v)}$$

Where: $$\phi = \sqrt{\frac{2^{-2/v}\Gamma(1/v)}{\Gamma(3/v)}} \quad \textbf{(5)}$$

The probability density function reduces to a standard normal distribution when the GED parameter $(v) = 2$. When $v < 2$, the density has a fatter tail than the normal density; $v > 2$ signifies a thinner tail than the normal density. We expect $v < 2$ in most cases so that the probability density function is fat-tailed.

Maximum likelihood techniques, based on the Berndt-Hall-Hall-Hausmann algorithm (Berndt et al., 1974) were used to estimate the parameters α_0, α_1, b and c in equation 4 above. Given a sample of T observations, and assuming conditional normality the model was estimated by maximizing the following log-likelihood function in E-views:

$$L_t = -\frac{1}{2}\log(2\pi) - \frac{1}{2}\log\sigma_t^2 - \frac{1}{2}(Y_t - X_t\emptyset)^2/\sigma_t^2 \qquad \textbf{(6)}$$

RESULTS

Of the three models, two (conditional variance models for the retail and producer price series) were specified as EGARCH (1,1*)* while the conditional variance model for the wholesale price series was specified as an EGARCH (1,2*)* model based on the results of the Box-Jenkins estimations. Table 3 shows the EGARCH models for both retail, wholesale and producer prices from South Africa and Namibia respectively. In the three models, b, which is the measure of volatility persistence is statistically significant and close to 1. This result suggests that after an incidence of a shock, volatility persists for a long period in the three markets. Volatility persistence is greater in the Namibian sheep market than in the South African sheep wholesale and retail markets. This is reasonable, since South African sheep market is larger in terms of volume and it is better structured than in Namibia. It is noteworthy, that volatility persists more in the retail market in South Africa than in the wholesale market. This means that price is stickier in the retail market than the wholesale market in South Africa, suggesting a greater impact of price volatility on South Africa consumers than the processors.

The asymmetric parameter λ, is only significant for the producers' sheep prices in Namibia. The sign of coefficient of the asymmetric parameter is negative suggesting that a negative shock does not have the same effect as a positive shock of the same magnitude. The significance of the asymmetric parameter for the producers' prices of sheep in Namibia implies that there is asymmetric interference in sheep prices in Namibia, as opposed to South Africa where there's no evidence of asymmetric interference. This result is suggestive of the impact of the SLMS on sheep prices in Namibia. This is expected, since the abattoirs in Namibia cannot handle the large influx of live sheep from farmers after the SMLS was introduced. Although one might expect a balancing-effect from the occasional suspension of SLMS ratios for farmers to export to South Africa unimpeded, but such once-in-a-while program cannot mitigate the effect of over-concentration at the processing level on sheep prices in Namibia.

The GED thickness parameters are 1.58, 1.10 for retail price in South Africa and producer price in Namibia respectively. This suggests that the underlying distribution is thicker than the normal distribution. Conversely however, the underlying distribution for the wholesale price of sheep in South Africa is thinner than the normal distribution given that the GED parameter is 5.99. The Jarque-Bera normality test statistics for the three models show that the standardized residuals for the prices series are now normally distributed. This justifies the use of the GED distribution over the robust t-statistics, since it would have been inappropriate to use the GED distribution if normality was not restored by the GED parameter (Bollerslev and Wooldridge, 1992). Also, the Ljung-Box statistics for standardized residuals and squared standardized residuals show that the EGARCH model is appropriate since it sufficiently explained all linear and non-linear sources of variation in the price series.

Table 3: EGARCH model estimation: retail, wholesale and producer prices: 2000:1–2008:4

Parameter	Retail price	Wholesale price	Producer price

α_1	**1.1426****	**1.0182****	**0.5990****
α_2	**-0.3385****	**-0.2710****	**0.2408****
T	**0.0082****	**0.0088****	**0.0097****
α_0	**-2.4360****	**-2.5517****	**-9.4796****
a	**0.5605***	**-0.8705****	**0.2276***
b	**0.7198****	**0.4996****	**-0.9025****
λ	**0.1122**	**-0.1211**	**-0.2254***
GED parameter	**1.585****	**4.9966***	**1.1044****
Log-Likelihood	**208.2510**	**181.6306**	**109.5373**
Diagnostics of Standardized and Squared Residuals			
Ljung-Box (12)	**7.48**	**29.61**	**15.04**
	(0.679)	**(0.01)**	**(0.13)**
Ljung-Box^2(12)	**5.40**	**24.95**	**2.96**
	(0.863)	**(0.05)**	**(0.98)**
Jacque-Bera	**6.59**	**4958.74**	**64.48**
	(0.037)	**(0.00)**	**(0.00)**

Notes: Single and double asterisks (*) signify statistical significance at the 0.05 and 0.01 levels respectively. Values in parenthesis under diagnostics of standardized and squared residuals are p-values.

[a]The parameters α_1 and α_2 represents the coefficients of first and second order autoregressive specified for the mean equations, T represents the deterministic trend, b represents volatility persistence while a measures the autoregressive conditional heteroscedasticity.

Table 4 shows the results from the multi-variariate EGARCH model of volatility spill-over. The X variable is the logged producer price of sheep in Namibia, which was added as an explanatory variable in the mean equation. This is consistent with the main hypothesis for this study: that is price changes in the Namibian sheep market affects sheep prices in South Africa. The model shows significant volatility spill-over from the Namibian to South African sheep market. Specifically, 79 percent of the volatility in the Namibian market is transmitted through sheep meat retail prices to the South African sheep market. The measure of volatility persistence is significant; indicating that 45 percent of the volatility transmitted to the South African sheep market is persistent. Furthermore, the asymmetric effect is now significant at 5 percent in the volatility spill-over model. This suggests that these two markets are somewhat integrated, since the incidence of volatility spill-over from Namibia has influenced price information transmission in the South African sheep market. Overall, the model shows a strong influence of Namibian sheep price volatility on the South African sheep meat market.

An interesting dimension to this debate is the question of whether the volatility spill-over from the Namibian sheep market affected processors in South Africa. The third column in Table 4 answers this question. The carcass price per kg was analyzed for volatility spill-over effect. The coefficient of the spill-over variable appears non-significant, showing that all the spill-over effect from Namibia was passed across to South African sheep meat consumers. The asymmetric effect is however significant at the 5 per cent level. Comparing the two models (i.e. retail and processors level spill-over effect), the asymmetric effect shows that the processing sector in South Africa is more linked to the Namibian sheep market than the retail level (39 per cent as compared to 5 per cent).

Table 4: Multivariate EGARCH model of volatility spill-over: 2000:1 – 2008:4

Parameter	Retail	Processing
X	0.34**	-
α_1	0.03	1.09**
α_2	0.02	-0.34**
T	0.01**	0.01**
a_0	-3.97**	-3.53**
a	0.01	-0.95**
b	0.45**	0.34
λ	0.05**	0.39*
c	0.79**	0.38
GED parameter	1.79**	3.02*
Log-Likelihood	201.88	178.53
Diagnostics of Standardized and Squared Residuals		
Ljung-Box (12)	17.17	15.04
	(0.07)	(0.13)
Ljung-Box^2(12)	12.17	2.96
	(0.27)	(0.98)
Jacque-Bera	0.99	0.77
	(0.64)	(0.68)

Notes: Single and double asterisks (*) signify statistical significance at the 0.05 and 0.01 levels respectively. Values in parenthesis under diagnostics of standardized and squared residuals are p-values.

[a]The parameters α_1 and α_2 represents the coefficients of first and second order autoregressive specified for the mean equations, T represents the deterministic trend, b

represents volatility persistence, α measures the autoregressive conditional heteroscedasticity while c captures the volatility spill-over effects.

Diagnostic tests using the Ljung-Box standardized and squared standardized test statistics confirm that the EGARCH model of volatility spill-over was not wrongly specified.

CONCLUSION

The potential negative consequences of increased price volatility are widely acknowledged in agricultural economics. Increased price volatility influences production as well as consumption choices of economic agents and can reduce the overall welfare in a country or in a Customs Union like SACU. The study explored the extent of volatility transmission in a Customs Union and its implications using sheep price data from South Africa and Namibia. The primary objective was to bridge the gap in agricultural economics literature regarding the extent of volatility transmission in a Customs Union using the South African Customs Union (SACU) as a case study. We also examined the effects of the introduction of the SLMS in Namibia on the nature of volatility spill-over to South Africa.

The new SACU came into effect in October 2002 which includes a marketing provision (Article #29) for Member States. Under this article, a member state can impose new marketing regulation for an agricultural commodity as long as it does not affect free trade of the commodity between members. Namibia took advantage of this Article and introduced the Small Livestock Marketing Scheme (SLMS) in July, 2004. Since the introduction of this program, price volatility in sheep markets both in Namibia and South Africa increased substantially. An attempt was made in this paper to determine the extent of increased price volatility and to determine if the increased price volatility of sheep in Namibian market is spilled over on the sheep market in South Africa

We found evidence of significant volatility spill-over between Namibia and South African sheep markets. Initial examination using CV established that there was increased volatility in the price series prior to and after the introduction of the SLMS on the one hand, and the new SACU agreement on the other hand. Thus, price volatility increased substantially in both markets after the introduction of the SLMS in Namibia. The conclusion therefore is that the perceived benefits of the SLMS need to be weighed against costs associated with increased price volatility induced by this program. Free movements of commodities, services and people across member states may be more beneficial for the SACU to look into rather that the SLMS type schemes.

We further analyzed the nature of price volatility and volatility spill-over. Volatility persistence is greater in the Namibian sheep market than in the South African sheep wholesale and retail markets. We also found that there is asymmetric interference in sheep prices in Namibia, as opposed to South Africa where there’s no evidence of asymmetric interference. This result is suggestive of the impact of the SLMS on sheep prices in Namibia. The EGARACH model of volatility spill-over shows significant volatility spill-over (of up to 79 percent) from the Namibian to South African sheep market through sheep meat retail prices. An important result is the extent to which the volatility transmitted to South Africa has been reflected on retail prices (with consumers bearing most of it), even though that the processing sector in South Africa is more linked to the Namibian sheep market than at the retail level (39 per cent as compared to 5 per cent).

Policy lessons from this study include:

- Examining the nature of market integration and price transmission is important in policy formulation within a customs union; since policies developed in one country can affect another member-country market.
- Price volatility influences price determination at every level of the value chain and it can be transmitted across the chain.

- The nature of volatility and volatility spill-over is very important not only to producers but also to consumers, since there is a high tendency for them to receive the greatest share of the negative effects of volatility.

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