# The Effect of Monetary Changes on Relative Agricultural Prices

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## Abstract

*Relative change in agricultural prices determines farmers` investment decisions, productivity and income. Thus, understanding the factors that influence agricultural prices is fundamental for sustainable growth in this sector and the rest of the economy. This paper investigates the short- and long-run impacts of monetary policy changes on relative agricultural prices in South Africa by employing Johansen cointegration analysis and the Vector Error Correction Model (VECM) respectively. The results of Johansen cointegration analysis reject the long-run money neutrality hypothesis which suggests that the rate of increase in prices is not unit proportional to the rate of increase in money supply. On the other hand, the results of the dynamic relationships provide evidence of agricultural prices being overshot. Therefore, when a monetary shock occurs, the agriculture sector will have to bear the burden of adjustment, increasing farmers' financial vulnerability. Consumers also have to absorb short-run price volatility and overshooting of prices which in turn impacts on their ability to manage their cash flow optimally; this could be a substantial challenge in poor households. Due to the linkages between monetary policy variables and relative agricultural prices, it is recommended that agricultural policy makers and monetary authorities work closely in designing and implementing monetary policy in the country. This is important because monetary policies meant to stabilize the economy may have less desirable impacts on farmers and consumers, especially in the short run.*

**Keywords:** Monetary Policy, Error Correction Models, Agricultural Prices, Industrial Prices, Money Neutrality

## 1. Introduction

Agriculture has played a pivotal role in the South African economy and will continue to do so. The fact that primary agriculture only contributed between 3 to 5 per cent to the GDP of South Africa over recent years understates the actual

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importance of this sector in the local economy. This phenomenon has received attention from various researchers in the past, e.g. Brand (1969); Döckel & Groenewald (1970); Faux (1990); Van Rooyen, Carstens and Nortje (1996); and Asfaha and Jooste (2006). These authors and others agree that agriculture's strategic importance lies in its forward and backward integration with the rest of the economy, the establishment and maintenance of food security, foreign exchange earnings and employment. Added to the aforementioned is the strategic position of the agricultural sector in that most land in South Africa is currently utilized by agriculture and should hence play a vitally important role in economic development in rural areas to alleviate poverty. It is therefore not surprising that agriculture is recognized in terms of the Accelerated and Shared Growth Initiative for South Africa (Asgisa) as one of the sectors that can and should play a role to achieve government's economic growth targets, consequently alleviating extreme rural poverty.

A recent study by Rodrik (2006:23) within the framework of Asgisa emphasizes the importance of monetary policy in enhancing economic growth in South Africa. The question that arises is the extent to which changes in monetary policy affect the agricultural sector. The impact of macroeconomic factors on the agricultural sector already received attention in agricultural economics literature in the second half of the 1970s (see for example, Schuh, 1974; Tweeten, 1980; Bessler, 1984; Chambers, 1984; Orden, 1986; Barbhart, 1989; Orden and Fackler, 1989). These studies provide evidence of significant linkages between money supply, interest rate, exchange rate, agricultural and manufacturing prices. More importantly, these studies suggest that any changes in macroeconomic policy should impact agricultural prices, farm incomes and agricultural exports. For instance, high agricultural price volatility caused partially by macroeconomic policy changes increases the uncertainty faced by farmers and affects their investment decisions, with important implications for farm debt, farm incomes and agricultural productivity (Kargbo, 2005). Furthermore, one has to consider changes in monetary policy within the broader economic context in that changes in monetary policy to induce favorable change in the industrial sector, for example, might have less than favorable outcomes in the agricultural sector and vice-versa.

Given the potential negative impacts of price volatility on the agricultural sector, this study investigates the long- and short-run effects of monetary changes on relative agricultural prices using the Johansen approach for cointegration test and the Vector Error Correction Model (VECM) respectively. The long-run results examine whether agricultural and industrial prices respond proportionally to monetary changes in the long run, i.e. it examines whether the monetary neutrality hypothesis holds in the South African economy. Results from the VECM test concern the "overshooting[3]" hypothesis, i.e. the phenomenon of agricultural prices overshooting their long-run equilibrium in the short run in response to monetary changes.

Organization of the paper is as follows. In the following section, some theoretical and empirical studies are reviewed. In the third section, the stationary properties of the variables and long-run results from the Johansen cointegration analysis are presented. In the fourth section, VECM is employed to investigate the short-run dynamics of agricultural and industrial prices to monetary changes. The final section provides a conclusion.

## 2. Theoretical and empirical studies

Since Schuh (1974) first pointed out the importance of macroeconomic and financial factors in determining agricultural commodity prices, Frankel (1986) was the first to demonstrate that monetary changes can have short-run real effects on agricultural prices using Dornbusch`s "overshooting" model. He emphasized the distinction between "fix-price" sectors (such as industrial and services sector), where prices adjust slowly, and a "flex-price" sector, such as agriculture, where prices adjust instantaneously in response to monetary changes. The results of his study show that monetary changes can cause agricultural prices to overshoot their long-run equilibrium, i.e. monetary changes can have real short-run effects on agricultural prices. Furthermore, he argues that the relatively slow speed of adjustment of industrial prices to monetary changes adds to overshooting in agricultural prices.

Extending the work of Frankel and Hardouvelis (1985), who believed that unanticipated money changes are crucial in determining the evolution of commodity prices, Lai, Hu and Wang (1996) extended Frankel`s framework to investigate the robustness of the overshooting hypothesis in agricultural prices when the economy experiences anticipated or unanticipated monetary changes. Their finding was that agricultural prices may overshoot their long-run equilibrium level if the monetary changes are unanticipated. Other theoretical studies on the overshooting hypothesis of agricultural prices include Bordo (1980), Chambers and Just (1980) and Orden (1986).

[3] Overshooting of prices is defined as a temporary change in its value beyond its long-run equilibrium (for example, when agricultural prices change more than proportionally in response to monetary changes).

Various theoretical explanations are given for instantaneous changes in agricultural prices. It is usually assumed that agriculture is a sector in which prices are more flexible than prices in non-agricultural sectors (Lai *et al*., 1996 and Robertson and Orden, 1990). Bordo (1980) argues that agricultural commodities tend to be more standardized and exhibit lower transaction cost than manufactured goods so that agriculture prices are characterized rather by short-term contracts and respond more quickly to monetary changes than the prices of other goods. Thomsen and Foote (1952) state that adjustment in agricultural production requires a much longer time, so changes in demand are likely to be reflected more in price changes than short-run production volume changes.

Recently, there has been renewed interest in the empirical analysis of the impact of monetary changes on agricultural prices by employing cointegration and VECM analysis. These studies examine whether agricultural and industrial prices respond proportionally to monetary changes in the long run (i.e. the hypothesis of long-run money neutrality[4]) and whether there are predictable deviations from such neutrality in the short run (i.e. the overshooting hypothesis).

For instance, Orden and Fackler (1989) used a vector autoregression (VAR) model and impulse response functions to show that an increase in money supply raises agricultural prices relative to the general price level for more than a year, suggesting the effect of monetary changes on real agricultural prices both in the short and long run. Similarly, Saghaian, Reed and Merchant (2002) and Bakucs and Ferto (2005) extended Dornbusch`s model using monthly data and found that monetary changes can have real short- and long-run effects on agricultural prices. In other words, their results provide evidence for the overshooting hypothesis but against the monetary neutrality hypothesis. Among other empirical studies that provide evidence for the overshooting hypothesis and against the money neutrality hypothesis are Bessler (1984), Chambers and Just (1982), and Devadoss and Meyers (1987).

However, other studies provide evidence supporting both the overshooting and monetary neutrality hypothesis (for example see, Robertson and Orden, 1990; Cho *et al*., 2004). In other words, these studies argue that monetary changes can have effects on real agricultural prices only in the short run but not in the long run.

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[4] The hypothesis of long-run money neutrality states that in the long-run, all prices change proportionally to money changes. In other words, a certain percentage change in money supply causes all prices to change by the same percentage.

Therefore, the above studies make it clear that the overshooting hypothesis of agricultural prices cannot not be rejected. However, the long-run effect of monetary changes on relative agricultural prices (i.e. the hypothesis of long-run money neutrality) still remains a controversial issue. According to Bakucs and Ferto (2005), the inconclusive results of the long-run effects of monetary changes on real agricultural prices can be attributed to the problem in variable choice, mistreatment of the time series properties of the data (especially in the case of earlier research) and misspecification of the macroeconomic model.

## 3. Data and empirical results

The Saghaian *et al.* (2002) overshooting model illustrates a long-run relationship between money supply, agricultural and industrial prices and the exchange rate. In this study, monthly time series of the agricultural production price index ($P_{at}$), industrial production price index ($P_{mt}$), exchange rate between the Rand and US dollar ($EX_t$) and money supply ($M_t$) for the period January 1995 to June 2005 (consisting of 126 observations) were used[5]. All the data were transformed by taking logarithms. Data sources are from Statistics South Africa and the Reserve Bank of South Africa.

The monthly data for the two price indices (agricultural and industrial) are depicted in Figure 1. The two price indices have risen over time, with agricultural prices exhibiting more monthly variability than industrial prices. The results obtained in the next sections, i.e. agricultural prices adjust faster to monetary changes than industrial prices, can partially explain the relatively higher variability of agricultural prices than industrial prices as depicted in Figure 1.

[5] The measure of money supply is the level of M1 (currency plus demand deposits)

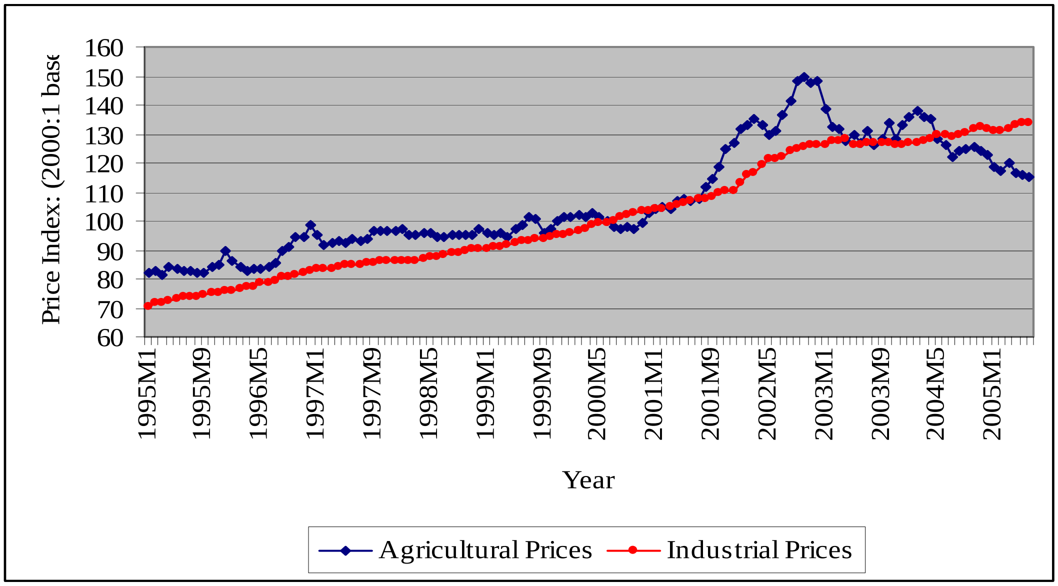


**Figure 1: Monthly changes in agricultural and industrial prices, (1995/01 to 2005/01)[6]**
*Source:* SARB, 2006

### 3.1 Stationarity and integration tests

Previous studies indicate that time series data for agricultural and industrial prices, exchange rate and money supply, be it monthly, quarterly or annual, are likely to be nonstationary (see for example Saghaian *et al*., 2002; Bakucs and Ferto, 2005; Cho *et al*., 2004). In this study, the Augmented Dickey-Fuller (ADF) unit root test, with and without a linear trend, is performed to test for the stationarity of the variables considered. The ADF test with a linear trend checks if the variables are trend stationary. The results are presented in Table 1.

The ADF test is sensitive to the choice of order of the lag. Therefore, the analysis started with an overspecified ADF test where the order of the lag was relatively large, after which the order of the lag that corresponded with the lowest Akaike Information Criterion (AIC) was chosen. The ADF tests for the first four variables in Table 1 show that the absolute values of the ADF test statistics were lower than the 95% critical value. This suggests that the null hypothesis of the unit root for these variables is not rejected and none of these variables are (trend) stationary in levels at the 5% significance level.

The ADF test was again performed for each first differenced series to check if all the series are integrated order one, I(1), or integrated of higher order. This time

[6] M1 refers to the first month of the year, January , M2 refers to the month of February and so on

ADF, with a drift only, was performed because there was no evidence of a linear trend in the first difference of the variables. The results are shown in the last four rows of Table 1. The unit root null hypothesis is rejected at the 5% significance level for all series in first difference, suggesting that all the series are I(1). Thus, a cointegration approach is used to obtain the long-run relationship between the variables.

**Table 1: ADF statistics for testing stationarity of the variables**

| Variables | Specification | Lags | Test statistic |
|---|---|---|---|
| $\ln P_{at}$ | Constant only | 2 | -1.5859 |
| | Constant and trend | 2 | -1.6514 |
| $\ln P_{mt}$ | Constant only | 6 | -.83165 |
| | Constant and trend | 6 | -3.0168 |
| $\ln EX_t$ | Constant only | 1 | -1.8600 |
| | Constant and trend | 1 | -1.2893 |
| $\ln M_t$ | Constant only | 5 | -1.7652 |
| | Constant and trend | 5 | -2.5005 |
| $\Delta\ln P_{at}$ | Constant only | 1 | -6.1107 |
| $\Delta\ln P_{mt}$ | Constant only | 2 | -6.6123 |
| $\Delta\ln EX_t$ | Constant only | 1 | -6.0740 |
| $\Delta\ln M_t$ | Constant only | 1 | -10.4779 |

95% critical value for the ADF is -2.8857 when only intercept is included and -3.4478 when the specification includes an intercept and a linear trend. The AIC was used to determine the lag length. Critical value for the first difference is -2.8859.

### 3.2 Cointegration Test

The Johansen technique for cointegration test is more popular than other techniques for cointegration testing, such as the Engle and Granger and autoregressive distributed lag (ARDL) techniques. One of the reasons for its popularity is that it allows one to determine the number of cointegrating relationships present in the data (Fedderke, 2001). Therefore, in this study, the Johansen approach was used to determine and estimate the cointegrating relationships between the agricultural and industrial prices, exchange rate and money supply.

First the VECM lag length had to be selected. The procedure is similar to that of the ADF test. In both cases, initially, the model was overspecified by using an order high enough to be reasonably confident that the optimal order would not exceed it (in this case 12). Then the various lag length criteria, which include AIC, SBC (Schwarz-Bayesian Criterion) and LR (Likelihood Ratio statistics) tests, were used to determine the optimal lag length. The various lag-length criteria suggested different lag lengths. For instance, the AIC suggested 12, while the SBC indicated 2 as the optimal order of the VAR. Five lags in the VAR model was considered as enough to obtain uncorrelated residuals in Bakucs and Ferto (2005) and 4 in Saghaian *et al.* (2002). In this study, 5 lags in the VAR model was considered as optimal lag order. The LR statistics test (both adjusted and unadjusted) also suggested 5 as the optimal order of the VAR.

The next question was the choice of appropriate deterministic components (a constant and a time trend) in the model. Plotting the variables both in levels and first differences can indicate whether the drift characteristic of the data requires that the intercept be included in the cointegrating space or the short-run specification of the model. However, plotting the data was not conclusive enough to indicate whether a trend term was present in the long-run specification of the model; this can be attributed to omitted variables not included in estimation (Harris, 1995). Therefore, to provide a clearer structure to the choice of appropriate deterministic components in the model, the Pantula principle suggested by Johansen (1992) was used. The result indicated the inclusion of only unrestricted drift in the model.

Having determined the appropriate VECM, the maximal eigenvalue and trace statistics were generated to determine the number of cointegration vectors $(r)$ present in the data (see Table 2). The trace statistics test rejected the null hypothesis that $r = 0, r \leq 1$ and $r \leq 2$ at the 5% significance level. However, it failed to reject the null hypothesis that r ≤ 3 at the 5% significance level. Thus, the trace statistics indicates 3 cointegration vectors at the 5% level.

However, the maximum eigen statistic indicates at most one cointegrating vector. Monte Carlo studies suggest that the trace statistic is more robust to both skewness and excess kurtosis in residuals than the maximal eigenvalue test (Fedderke, 2001). Therefore, based on the results of the trace statistics, it was concluded that there are three cointegrating vectors among the variables considered. The AIC and HQC (Hannan-Quinn Criterion) also indicated at most three cointegrating vectors. The existence of three cointegrating vectors among these variables implies that shocks to macroeconomic variables find their way into the agricultural sector.

**Table 2: The trace and maximum eigen statistics for testing cointegration rank**

| Null Hypothesis | Eigenvalue | Trace Statistic | 95% critical value | 90% critical value |
|---|---|---|---|---|
| $r = 0$ | 0.25755 | 80.8194 | 53.4800 | 49.9500 |
| $r \leq 1$ | 0.16149 | 44.7856 | 34.8700 | 31.9300 |
| $r \leq 2$ | 0.12062 | 23.4739 | 20.1800 | 17.8800 |
| $r \leq 3$ | 0.063365 | 7.9208 | 9.1600 | 7.5300 |
| **Null Hypothesis** | **Eigenvalue** | **Max-Eigen Statistic** | **95% critical value** | **90% critical value** |
| $r = 0$ | 0.25755 | 36.0338 | 28.2700 | 25.8000 |
| $r \leq 1$ | 0.16149 | 21.3117 | 22.0400 | 19.8600 |
| $r \leq 2$ | 0.12062 | 15.5531 | 15.8700 | 13.8100 |
| $r \leq 3$ | 0.063365 | 7.9208 | 9.1600 | 7.5300 |

The Saghaian *et al*. (2002) model shows three possible long run relationships, i.e. between $\{P_{at}\}$ and $\{M_t\}$, $\{P_{mt}\}$ and $\{M_t\}$, and $\{EX_t\}$ and $\{M_t\}$. Table 3 presents the long-run coefficients for these three normalized cointegration vectors. The results are consistent with *a priori* expectations. For all three cointegration vectors, the slope coefficients are statistically significant and positive. The interpretation is straightforward, i.e. a 1% increase in the money supply leads to a 0.34699 and 0.50456 percent increase in agricultural and industrial prices, respectively and an increase (a depreciation) in the exchange rate by 0.41327 percent.

**Table 3: Results for normalized cointegrating vectors**

| Cointegrating vectors | Vector 1 | Vector 2 | Vector 3 |
|---|---|---|---|
| $\ln P_{at}$ | 1.000000 | 0.000000 | 0.000000 |
| $\ln P_{mt}$ | 0.000000 | 1.000000 | 0.000000 |
| $\ln EX_t$ | 0.000000 | 0.000000 | 1.000000 |
| $\ln M_t$ | 0.34699<br>(0.0965)[a] | 0.50456<br>(0.1137) | 0.41327<br>(0.1713) |
| Constant | -0.30834 | 1.65120 | -1.89340 |

[a] standard errors in parentheses

The money neutrality hypothesis expects the long-run rate of increase in prices to be unit proportional to the rate of increase in money supply (i.e. the coefficients for the money supply are expected to be close to one). However, the estimated coefficients are statistically less than one in all vectors (see Table 3). Therefore, the results reject the long-run money neutrality hypothesis. This result suggests that monetary changes can have a long-run real effect on agricultural prices. This conclusion is consistent with the study by Saghaian *et al*., (2002) and Bakucs and

Ferto (2005). Furthermore, the long-run rate of increase in agricultural prices in response to an increase in money supply is less than that of an increase in industrial prices. This result suggests that an expansionary monetary policy that causes inflation puts the agricultural sector into cost-price squeeze.

## 4. Estimating the VECM

Another important feature of the Johansen approach is that it simultaneously separates short-run dynamics and long-run equilibrium and does not allow the one to contaminate the other (Fedderke, 2001). Results for the short-run dynamics are presented in Table 4. The coefficients of the three cointegration equations in the VECM, known as the "speed of adjustments", measure how quickly the system returns to its long run equilibrium after a temporary shock.

The speed of adjustments of agricultural prices ($\alpha 11$), industrial prices ($\alpha 22$) and exchange rate ($\alpha 33$) to the long run equilibrium are -0.16638, -0.0020933 and -0.012869, respectively (see Table 4, given in italic and bold). All coefficients have a negative sign, as expected, but only the agricultural price coefficient is significant. The speed of adjustment is always expected to be negative since it implies a short run positive departure of prices from the long run money supply relationship, requiring prices to fall to restore equilibrium. For instance, agricultural prices must fall to re-establish equilibrium in the event of short-run overshooting.

The results that $\alpha 11>\alpha 33>\alpha 22$ in absolute value provides evidence of agricultural price overshooting in the short run. That is, it suggests that agricultural prices adjust faster than industrial prices to monetary changes, affecting real agricultural prices in the short run. The relatively high speed of adjustment of agricultural prices, i.e. the overshooting of agricultural prices, can partially explain the observed agricultural price variability (depicted in Figure 1). The remaining parameters estimates are presented in Table 4 for completeness.

The diagnostic tests are similar to those obtained by other studies (for example see Saghaian *et al*., 2002; Bakucs and Ferto, 2005). The coefficient of determination ($R^2$) ranges between 0.24 and 0.54, thus the model explains a relatively higher percentage of change in the macroeconomic variables than the model estimated by Bakucs and Ferto (2005). The P-values for J-B test statistics are very low (0.000) for the industrial price and exchange rate equations, rejecting the null hypothesis of normality in residuals. However, non-normality implies only that the results must be interpreted with care.

**Table 4: Short-run parameter estimates of theVECM**

| Variable | $\Delta lnP_{at}$ | $\Delta lnP_{mt}$ | $\Delta lnEX_t$ | $\Delta lnM_t$ |
|---|---|---|---|---|
| Ecm1(-1) | ***-0.16638**** | 0.014462 | -0.16820 | -0.099606 |
| Ecm2(-1) | 0.20797*** | ***-0.0020933*** | 0.12661 | 0.14923 |
| Ecm3(-1) | 0.066472*** | 0.0019801 | ***-0.012869*** | -0.002767 |
| $\Delta lnP_{at-1}$ | 0.086311 | -0.012999 | 0.31534** | 0.27499* |
| $\Delta lnP_{at-2}$ | 0.10293 | -0.0061497 | 0.0069474 | 0.24846 |
| $\Delta lnP_{at-3}$ | -0.032592 | -0.017678 | 0.11952 | -0.051595 |
| $\Delta lnP_{at-4}$ | -0.16197* | 0.0023036 | 0.076769 | 0.026391 |
| $\Delta lnP_{mt-1}$ | 0.45708 | 0.31656*** | -0.54520 | 0.85486 |
| $\Delta lnP_{mt-2}$ | -1.0034** | -0.20055** | 0.69911 | 0.020911 |
| $\Delta lnP_{mt-3}$ | 0.15773 | 0.29669*** | -0.037214 | -2.6891*** |
| $\Delta lnP_{mt-4}$ | -0.29947 | -0.055865 | 0.31745 | 1.4599* |
| $\Delta lnEX_{t-1}$ | 0.12122** | 0.058044*** | 0.31940* | 0.061794 |
| $\Delta lnEX_{t-2}$ | -0.11579* | 0.0088662 | -0.053774 | -0.30648** |
| $\Delta lnEX_{t-3}$ | 0.061948 | 0.012507 | -0.032657 | 0.14420 |
| $\Delta lnEX_{t-4}$ | -0.021368 | 0.026970** | -0.054159 | 0.090185 |
| $\Delta lnM_{t-1}$ | 0.14644** | -0.012369 | -0.048085 | -0.46188*** |
| $\Delta lnM_{t-2}$ | 0.11074* | 0.026355** | 0.007719 | -0.070587 |
| $\Delta lnM_{t-3}$ | 0.19203*** | -0.0095110 | 0.057746 | 0.0036938 |
| $\Delta lnM_{t-4}$ | 0.24774 | 0.014819 | 0.061252 | -0.049664 |
| $R^2$ | 0.38 | 0.54 | 0.24 | 0.41 |
| Durbin Watson | 2.037 | 1.9657 | 2.0075 | 1.9438 |
| LM (P-value) | 0.333 | 0.099 | 0.324 | 0.009 |
| RESET (P-value) | 0.927 | 0.061 | 0.092 | 0.889 |
| J-B (P-value) | 0.829 | 0.000 | 0.000 | 0.698 |
| ARCH (P-value) | 0.895 | 0.306 | 0.747 | 0.534 |

Note: *** 1% significance level, **5% significance level, *10% significance level. LM is the Lagrange multiplier test of residual serial correlation. RESET is a test for specification error. J-B is a test for normality in the residual. ARCH is a test for heteroscedasticity. P-value indicates the probability of making error by rejecting the null hypothesis.

## 5. Conclusion

Agriculture plays a pivotal role in the South African economy. Apart from its contribution to GDP, agriculture's strategic importance lies in its forward and backward integrations with the rest of the economy, the establishment and maintenance of food security, foreign exchange earnings and employment. The relative change in agricultural prices determines the income of the farmers, their investment decisions and the productivity in this sector. Thus, understanding the factors that influence agricultural prices is fundamental for the sustainable growth in this sector and the rest of the economy. The possible impacts of monetary and macroeconomic factors on agricultural prices have attracted the attention of many agricultural economists.

This study investigates the long-run and short-run effects of monetary changes on relative agricultural price using the Johansen approach for cointegration test and the VECM respectively. Results from the Johansen cointegration test indicate the existence of a long-run relationship between South African agricultural and industrial prices, the exchange rate and money supply. This implies that changes to macroeconomic variables find their way into the agricultural sector. Moreover, the results reject the long-run money neutrality hypothesis which suggests that the rate of increase in prices is not unit proportional to the rate of increase in money supply.

The results for the dynamic relationships indicate that agricultural prices adjust faster than industrial prices to innovations in money supply, providing evidence for the hypothesis that agricultural prices overshoot their long-run values in the short run. The overshooting of agricultural prices can at least partially explain the relatively high agricultural price volatility. Agricultural price volatility in turn increases the uncertainty faced by farmers and affects their investment decisions, productivity and income. Therefore, when a monetary shock occurs, the agriculture sector will have to bear the burden of adjustment, reducing the financial viability of South African farmers. Consumers also have to absorb short-run price volatility and overshooting of prices which in turn impacts on their ability to manage their cash flow optimally; this could be a substantial challenge in poor households.

Due to the linkages between monetary policy variables and relative agricultural prices, it is recommended that agricultural policy makers and monetary authorities work closely in designing and implementing monetary policy in the country. This is important because monetary policies meant to stabilize the economy may have less desirable impacts on farmers and consumers, especially in the short run.

**References**

**Asfaha TA & Jooste A (2006).** The agricultural input elasticity of rural urban migration in South Africa. *Agrekon*. Vol 45 (1): 89- 105.

**Brand SS (1969).** *The contribution of agriculture to the economic development of South Africa since 1910.* D.Sc (Agric) thesis, University of Pretoria.

**Bakucs LZ & Ferto I (2005).** *Monetary Impacts and Overshooting Of Agricultural Prices in an Open Economy*. Paper prepared for the XIth International Congress of the European Association of Agricultural Economists (EAAE), Copenhagen, Denmark, August 24-27, 2005.

**Barbhart SW (1989).** The effect of macroeconomic announcements on commodity prices. *American Journal of Agricultural Economics,* Vol 71:389-403.

**Bessler DA (1984).** Relative prices and money: a vector autoregression on Brazilian data. *American Journal of Agricultural Economics,* Vol 65: 25-30.

**Bordo MD (1980).** The effect of monetary changes on relative commodity prices and the role of long-term contracts. *Journal of Political Economy*, Vol 61: 1088-1109.

**Chambers RG (1984).** Agricultural and financial market interdependence in the short run. *American Journal of Agricultural Economics*, Vol 66:12-24.

**Chambers RG & Just RE (1980).** A critique of exchange rate treatment in agricultural trade model. *American Journal of Agricultural Economics*, Vol 62: 255-259.

**Chambers RG & Just RE (1982).** An investigation of the effect of monetary factors on the U.S agriculture. *Journal of Monetary Economics*, Vol 9:235-47.

**Cho G, Kim M & Koo WW (2004)**. The relative impact of national monetary policies and international exchange rate on long-term variations in relative agricultural prices. *Agribusiness and Applied Economic Report No. 528*. North Dakota State University.

**Devadoss S & Meyers WH (1987).** Relative prices and money: further results for the United States. *American Journal of Agricultural Economics,* Vol 69: 838-842.

**Döckel JA & Groenewald JA (1970).** *Die vraag na voedsel in Suid Afrika.* Agrekon 9(4): 15-20.

**Fedderke J (2001).** *Applied time series analysis*. University of the Witwatersrand, Econometric Research South Africa.

**Frankel JA (1986).** Expectations and commodity price dynamics: the overshooting model. *American Journal of Agricultural Economics*, Vol 68: 344-348.

**Frankel JA & Hardouvelis GA (1985).** Commodity prices, money surprises, and fed credibility. *Journal of Money, Credit and Banking*, Vol 17: 425-37.

**Faux CS (1990).** Input-output analysis of employment in agri-business. M.B.A. thesis, University of the Witwatersrand.

**Harris, R.I.D. (1995).** *Using cointegration analysis in econometric modelling.* Prentice Hall, England.

**Johansen, S. (1992).** *Identifying restrictions of linear equations*. Institute of Mathematical Statistics, University of Copenhagen.

**Kargbo JM (2005).** Impacts of monetary and macroeconomic factors on food prices in West Africa. *Agrekon*, Vol 44(2):205-221.

**Lai C, Hu S & Wang V (1996).** Commodity price dynamics and anticipated shocks. *American Journal of Agricultural Economics*, Vol 78: 982-990.

**Orden D (1986).** Money and agriculture: the dynamics of money-financial-market-agricultural trade linkages. *Agricultural Economics Research*, Vol 38(3): 14-28.

**Orden D & Fackler P (1989).** Identifying monetary impacts on agricultural prices in VAR models. *American Journal of Agricultural Economics*, Vol 71: 495-502.

**Robertson JC & Orden D (1990).** Monetary impacts on prices in the short and long run: some evidence from New Zealand. *American Journal of Agricultural Economics*, Vol 72: 160-171.

**Rodrik D (2006)**. Understanding South Africa's Economic Puzzles. Center for International Development Working Paper No. 130. Harvard University.

**Saghaian SH, Reed MR & Merchant MA (2002).** Monetary impacts and overshooting of agricultural prices in an open economy. *American Journal of Agricultural Economics*, Vol 84: 91-103.

**South African Reserve Bank (SARB) (2006).** *The home page of the South African Reserve Bank*. Online download facility at http://www.reservebank.co.za

**Schuh GE (1974).** The exchange rate and U.S agriculture. *American Journal of Agricultural Economics*, Vol 22: 278-289.

**Thomsen FL & Foote RJ (1952).** *Agricultural prices*. McGraw-Hill, New York.

**Tweeten LG (1980).** Macroeconomics in Crisis: Agriculture in an underachieving economy. *American Journal of Agricultural Economics*, Vol 62: 853-865.

**Van Rooyen CJ, Carstens J & Nortje A (1996).** *The role of agriculture in South African Economy: A research and technology challenge.* Annual Report of the Agricultural Research Council (ARC), Pretoria