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AUTHORS	Emmanuel Innocents Edoun Tarcicious Mufundisi Charles Mbohwa
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Emmanuel Innocents Edoun (South Africa), Tarcicious Mufundisi (South Africa), Charles Mbohwa (South Africa)

Assessment of impact devaluation on trade balance and marketing in Zimbabwe (1990-2005)

Abstract

The cost of Marketing in a company is so critical that, marketing become costly in International Business, especially when devaluation hits local currency. The primary purpose of this study is to find the impact of devaluation on trade balance in Zimbabwe using the Johansen-Juselius Cointegration and Vector Error Correction Model (VECM), unit root tests, and impulse response analysis. Quarterly data for the period 1990 to 2005 is used. The result shows that devaluation is effective in improving trade balance in the long run and there is a cointegrated relationship between the real effective exchange rate and trade balance in the long run. The findings initially revealed that there is a long run relationship between trade balance and exchange rate. Secondarily the real exchange rate is an important variable to the trade balance, and that devaluation will improve trade balance in the long run, thus consistent with the Marshall-Lerner condition and finally, the results indicate no J-curve effect in Zimbabwe.

Keywords: devaluation, trade balance, Johansen-Juselius cointegtation, vector error exchange rate.
JEL Classification: D50, C80.

Introduction

A number of researchers have found mixed results related to the relationships between devaluation and trade balance as shown by empirical literature below. Most of the literature on devaluation advocates devaluation as the panacea to trade imbalances (Dornbusch and Fischer, 1992). Since the inception of reforms in Zimbabwe from the 1990s, the local currency was devalued regularly but trade balance problems continued to deepen, with inflation reaching 231% million in 2008. In light of this, it seems plausible to examine the impact of devaluation on trade balance on the Zimbabwean economy. It is important to emphasize that, Kamoto (2006) studied the J-curve effect on the trade balance in Malawi and South Africa while Mafusire (1992) examined the effect of devaluation on budget deficit in Zimbabwe.

The findings of this study will be useful for Zimbabwe as it intends reintroducing the Zimbabwean currency that was phased out in February 2009. This will also assist the government in making meaningful choice of a monetary regime especially in light of the proposal for a common monetary area in the COMESA and free trade areas. An appropriate exchange rate will be vital for maintaining a favorable trade balance that will not result in increased inflationary pressures. Further, the study will also assist key stakeholders such as the government, central bank, investors and the private sector to develop sustainable export led growth policies that will enhance economic recovery efforts. Policies such as value addition and import substitution that failed to make an impact can also be reviewed given the findings of the study.

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1. Theoretical framework

1.1. The Marshall-Lerner condition, J-curve effect and trade balance. The impact of devaluation on trade balance may vary, probably due to different levels of economic development. One of the prominent impacts of devaluation is the Marshall-Lerner condition, which postulates that real devaluation leads to increases in the trade balance in the long run if sum up value of import and export demand elasticity exceed one.

Devaluation as a policy prescription is mainly aimed at improving the trade balance. However, there is a time lag before the trade balance improves following devaluation with different short and long run effects. Theoretically, after devaluation the trade balance deteriorates before it starts to improve in the long run until it reaches its long-run equilibrium. This can be explained by the quick rise in domestic-currency price of imports as compared to export prices soon after devaluation or depreciation, though quantities initially not changing very much. In the long run, the quantity of exports rises and the quantity of imports falls and export prices catch up with import prices, so that the initial deterioration in the trade balance is reversed (Dornbusch and Fischer, 1992). The time pathes through then the trade balance follows after devaluation generates a J-curve, by initially falling and reaching a minimum before it starts to increase (Salvatore, 2007).

The time lag can be attributed to the impact of several lags such as recognition, decision, delivery, replacement and production (Junz and Rhomberg, 1973). The recognition lag is the period that elapses between the time a disturbance occurs and the time the policy makers recognize that action is required (Dornbusch and Fischer, 1992).

Following a real depreciation, and before stakeholders get more information, it will take time for traders to recognize the changes in market competitiveness, and this may take longer in international markets than in domestic markets. Some time is spent on deciding on what business relationships to venture into and for the placement of new orders. There is a delivery lag that explains the time taken before new payments are made for orders that were placed soon after the price shocks. Procurement of new materials may be delayed to allow inventories of materials to be used up, this is a replacement lag. Finally, there is a production lag before which producers become certain that the existing market condition will provide a profitable opportunity (Kamoto, 2006).

1.2. Exchange rate and trade balance. Economists have been studying the correlation between the real exchange rate and trade balance because currency devaluation is often considered to improve the foreign sector of an economy. It is argued that devaluation of a currency raises the price of imports in comparison to that of its exports, and this causes the trade balance to improve leading to an improvement in the foreign sector of an economy. The improvement in the foreign sector raises output and employment in the overall economy (Shostak, 2007). This can be summarized in the following equation:

$$TB = f(RER). \qquad (1)$$

A fall in the real exchange rate implies growing competitiveness and a rise means falling international competitiveness. Hence, currency devaluation will lead to a fall in the real exchange rate and thus to an increase in international competitiveness, hence improvement in trade balance. A fall in foreign prices, however, will lift the real exchange rate and therefore reduce competitiveness. Therefore, it is quite clear that currency devaluation, all other things being equal, is beneficial for export growth (Shostak, 2007).

Dornbusch (1980) posits that currency devaluation will improve the trade balance provided that export and import elasticities are sufficiently large to offset the worsening of the terms of trade. But evidence from developing countries shows that such elasticities are low, largely due to the nature of exports and imports, and therefore devaluation may not result in an improvement in the trade balance. He concludes that devaluation is equivalent to an export subsidy and an import tax.

However, Ahamed (1984) asserts that devaluation has little effect (or even a perverse effect) on the trade balance. In terms of foreign prices, devaluation should almost always improve the trade balance as long as the demand for imports and exports are both affected by relative price changes and elasticity of demand for its exports, then devaluation will worsen its terms of trade. Ahamed (1984) however argues that no much evidence exists to support this assertion suggesting that most countries are price takers in export markets.

From Ahamed's contribution, in the context of a small open economy like Zimbabwe, it becomes clear that devaluation may not "almost always" improve the trade balance due to the nature of demand elasticities and structural and institutional rigidities that characterize poor countries as explained by Taylor (1979).

1.3. Empirical evidence. A number of studies have been done to establish the relationship between devaluation and balance of trade. However, empirical findings on the effects of currency devaluation on trade balance are mixed. Using annual data from 14 countries over the period 1956-1972, Miles (1979) found that devaluation does not improve the trade balance, through increases in export performances, but they do improve the balance of payments through the capital account. Sundararajan and Bhole (1988) reinforce Miles' finding that devaluation improves the balance of payments of India. Buluswar et al. (1996) found that devaluations have had no significant long-run effect on the trade balance for India. Upadhyaya and Dhakal (1997) tested the effectiveness of devaluation on the trade balance in eight developing countries. The estimated results suggest that devaluation, in general, does not improve the trade balance in the long run.

Bahmani-Oskooee and Alse (1994) employed the Engle-Granger cointegration technique on quarterly data from 1971 to 1990 on the trade balance and real effective exchange rate of 19 developed and 22 less developed countries and find that the long-run impact of devaluation on the trade balance is positive for Costa Rica, Brazil, and Turkey; negative for Ireland. For Canada, Denmark, Germany, Portugal, Spain, Sri Lanka, the UK and the USA, there is no long-run effect. Yiheyis (2006) studied the contractionary devaluation hypothesis in the context of selected 20 African countries. The results of this study indicate that the contemporaneous output effect of nominal devaluation is negative, providing statistical support for the hypothesis that devaluation is contractionary in the short run. On the other hand the coefficient of the lagged rate of devaluation is found to be positive, implying that the contractionary problem is temporary.

Interestingly, in some cases devaluation has a perverse effect. Bahmani-Oskooee (1985) studied the effect of devaluation in four developing countries namely Greece, India, Korea and Thailand. However, with the exception of Thailand, his findings indicate that devaluation in the long run deteriorates the trade balance. Fascinatingly, the long-run impact on the trade balance is favorable only in the case of Thailand. Brissimis and Leventankis (1989) studied the effect of devaluation in Greece using quarterly data, covering the period from 1975 to 1984. His findings indicate that devaluation in the long run deteriorates the trade balance.

Narayan (2004) tests for the existence of any cointegration relationship between trade balance and real effective exchange rate, foreign income and domestic income for New Zealand during the period 1970-2000. The results indicate that there is no cointegration relationship between the above variables. Gomes and Paz (2005) investigated the effect of real exchange rate depreciation on the Brazilian trade balance in the 1990s. They found that Marshall Learner condition held in that period. Shirvani and Wilbratte (1997), Akbostanci's (2002) and Liu, Fan and Shek (2006) also found Marshall-Lerner condition hold in their respective studies. Shirvani and Wilbratte (1997) examined the relationship between trade balance and real exchange rate in the United States and the G7 countries of Canada, France, Germany, Italy, Japan, United Kingdom and United States, Akbostanci's (2002) in Turkey while Liu, Fan and Shek (2006) in Hong Kong.

Besides, Onafowora (2003) reported significant relationship exist for three ASEAN countries of Thailand, Malaysia, and Indonesia in their bilateral trade to United States and Japan. In contrast, Rose (1991) reported the Marshall-Lerner condition does not exist in five major OECD countries (United Kingdom, Canada, Germany, Japan, and the United States). Her results also showed insignificant relationship between trade balance and exchange rate, thus implying that devaluation could not improve trade balance in the long run. Using cointegration test, Hatemi and Irandoust's (2005) study showed Sweden did not satisfy Marshall-Lerner condition. This might be due to the trade balance in Sweden being insensitive to real exchange rate but only sensitive to changes in income.

It can be noted that the empirical evidence has been rather mixed, or inconclusive in the studies mentioned above. This study on Zimbabwe, will therefore, provide vital information on the relationship and impact of exchange rate and trade balance to policy makers after analyzing the results.

2. Methodology

This section presents the model to be estimated and describes the estimation procedures in analyzing the relationship between devaluation and trade balance. The study makes use of econometric tools to analyze the effect of devaluation on trade balance. The section also discusses the data sources and definitions.

2.1. Model specification. Other than real exchange rate trade balance is also explained by both real domestic and foreign income. Equation 2, to be used as the general model, is the traditional Keynesian function for trade balance:

$$TB = f(RER, Y, Y^*), \quad (2)$$

where, TB is the trade balance, expressed as the ratio of exports to imports; RER is the real exchange rate defined as

(foreign price*exchange rate)/ domestic prices (3)

Y is domestic income; and Y^* is foreign income.

Taking natural logarithm on both sides, equation 2 becomes

$$\ln(TB_t) = \beta_0 + \beta_1 \ln(RER_t) + \beta_2 \ln(Y_t) + \beta_3 \ln(Y_t^*) + e_t, \quad (4)$$

where, e_t is the stochastic error term; and β_0, β_1, β_2, and β_3 are parameters to be estimated.

Since all the variables are logged, the parameter estimates would be interpreted as elasticities. The use of natural logarithms on the ratio of exports to imports, takes into account possible negative values of the trade balance in case of trade deficit (Han-Min Hsing, 2003).

3. Data sources and definitions

3.1. Data description and sources. The study uses quarterly data for official exchange rate, exports, imports, Consumer Price Index (CPI) and GDP for Zimbabwe from 1990 to 2005. This period witnessed the expansion and massive contraction of the Zimbabwean economy after the structural reforms of 1990. One key reason to limit the study to this period is that, this period covers the most notable events in the process of Zimbabwe's foreign trade system reform. These include among others the removal and reintroduction of price controls, use of the managed floating exchange rate system, introduction of the fixed exchange rate regime in 2001 and the foreign exchange retention systems in 2000s. During the same period Zimbabwe made commitments in the World Trade Organization in 1994, the Preferential Trade Area (PTA) in 1994, and COMESA Free Trade Areas (FTA) in 2000.

The data is obtained from the Reserve Bank of Zimbabwe (RBZ) and the Zimbabwe Statistical Agency (ZIMSTATS). Quarterly data for US GDP and CPI for the same period are used to depict foreign income and foreign CPI respectively. The US data are obtained from the IMF International Financial Statistics (IFS).

It should be noted that the data on the exchange rate is the official exchange rate rather than the parallel market exchange rate. The exchange rate is the exchange rate between the Zimbabwean dollar and the United States dollar. The use of official exchange rate stems from the fact that parallel exchange rate data are not reliable and conflicting.

3.2. Description of variables and their expected signs. *3.2.1. Real exchange rate.* The real exchange rate is a key macroeconomic variable, which plays an important role in the broad allocation of resources in production and spending behaviour in the economy. If the Marshall-Lerner theory holds, β_1 is expected to be positive indicating that devaluation leads to an improvement in the trade balance for Zimbabwe The real effective exchange rate, as a measure of competitiveness also determines and influences the performance of export sector. Consequently currency devaluation will lead to a decrease in the export-import ratio in the short run due to price effect. In the long run, when the volume effect takes over, the trade balance improves. Thus, a positive sign on β_1 is expected since the higher the exchange rate, the lower the trade balance.

3.2.2. Domestic income. Following the classical theory, the impact of domestic income on trade balance and hence the sign of coefficient β_2, is ambiguous. If the estimate of β_2 is negative, it means that an increase in Zimbabwean real income, Y, increases imports volume. However, if the estimate of β_2 is positive, it means that an increase in *Y*, is due to an increase in the production of import-substituted goods.

Total imports and exports are sensitive to movements in exchange rate (Choudry, 2005, 2008). An increase in domestic output raises imports but could also boost exports, and the net effect on the trade balance could either be an improvement or a worsening. It is now well understood that the supply driven output growth, for example due to an increase in productivity, leads to an improvement of the trade balance. Historic examples are those of Germany and Japan in the 1960s and the 1970s, China in the 1990s and the 2000s. On the other hand, the demand driven increase in output, as in e.g. US in the 1970s and the 2000s, ends up with trade balance deteriorations (Mladenović and Nojković, 2010). The Zimbabwe GDP is used as a proxy for domestic income.

3.2.3. Foreign income. Theory suggests that the volume of exports ought to increase as the real income and purchasing power of the trading partner rises, and vice versa. A growing economy results in increased exports through increased productivity and low inflation levels. This will result in increased competitiveness and expansion of production capacity. Therefore, according to the classical theory, the estimate of β_3 could be either positive or negative. The sign of β_3 would depend on whether the supply side factors dominate the demand side factors. The USA GDP is used as a proxy for foreign income, given the central role the US plays in international trade.

4. Estimation method

4.1. Stationarity tests. Time series data tend to be non stationary due to time variations in the distributions. To test for non stationnarity, unit root tests will be conducted, and where the series is non-stationary, appropriate differencing is conducted until the series becomes stationary. According to Enders (2004), stationarity implies that a variable has a constant, time invariant mean, variance and zero auto covariance. A non-stationary variable can be made stationary by either differencing or detrending. There is no consensus regarding the method of testing for the unit root test and this paper will use the Phillips-Perron test.

Unit root testing in macroeconomic data is much more important because it determines the appropriate model for estimating parameters. When non-stationary variables are treated as stationary in a classical regression model, this results in spurious regression where the t-statistics appear to be significant, with high R-squared values but the results are of no economic meaning.

4.2. Cointegration tests. Once it is established that the series are I(1), we can proceed to test for a long-run equilibrium relationship between the series. If such a relationship exists, series are cointegrated. Following the work of Shirvani and Wilbratte (1997), Baharumshah (2001), Onafowora (2003), Gomez and Alvarez-Ude (2006), the Johansen-Juselius test is used to test if a long-run relationship specified in equation 4 exists. The Johansen-Juselius test can distinguish between the existences of one or more cointegrating vectors and also generate test statistics with exact distributions. The Johansen-Juselius technique identifies and provides robust estimates of stationary linear combinations of the variables that individually follow nonstationary processes.

Thus, assuming a vector autoregressive (VAR) model:

$$\Delta X_t = \sum \Gamma_i X_{t-i} + \Omega X_{t-1} + \mu + \varepsilon_t, \quad (5)$$

where X_t is a vector of endogenous variables p x 1 and (i = 1,……., k).

The Johansen-Juselius method tests whether the coefficient matrix Ω reflects the fundamentals of long run equilibrium among the non-stationary variables. As a result, if 0 < rank, $\Omega = r < p$, then there are matrices α and β of dimension p x r where $\Omega = \alpha\beta'$ and r cointegrating relations among elements of X_t; where α and β are cointegration vectors and error correction parameters, respectively.

In the Johansen-Juselius method, two tests are used to determine the number of cointegrating vectors (r): the trace test and the maximum eigenvalue test. In the trace test, the null hypothesis is that the number of cointegrating vectors are less than or equal to r, where r is 0, 1, or 2. In each case, the null hypothesis is tested against a general alternative. In the maximum eigenvalue test, the null hypothesis $r = 0$ is tested against the alternative that $r = 1$ and $r = 1$ against the alternative $r = 2$, etc.

4.3. J-curve effect. Following works of Baharumshah (2001), Onafowora (2003), Sugema (2005) and Gomez and Alvarez-Ude (2006), the impulse response function is used to determine whether J-curve theory exists in Zimbabwe. The generalized impulse response function reveals insights into the dynamic relationships in existence as they portray the response of a variable to an unexpected shock in another variable over a given time horizon. According to Gomez and Alvarez-Ude (2006), the impulse response function map out the dynamic response of trade balance to Cholesky one standard deviation real exchange rate innovation.

4.4. Model adequacy tests. To determine the adequacy of the estimated model it is necessary to perform various diagnostic tests. Therefore, LM, White and Jarque-Bera tests are used to test for serial correlation, heteroskedasticity and normality in the residuals respectively.

4.5. Limitations of the study. The analysis of this article could not go beyond the period 1990-2005 because the Initial objective of the paper was to convincingly assess “The Impact Of Devaluation On Trade Balance and In Marketing In Zimbabwe” within that specific period 1990-2005. Because it is during this period that inflation rose to the highest leading to difficult leaving conditions. That is why the paper was seeking to understand whether devaluation is effective in improving trade balance in the long run and whether there is a cointegrated relationship between the real effective exchange rate and trade balance in the long run. Devaluation only happened within that period in Zimbabwe and this is what led to the dollarization of the economy. So this study could not go beyond this period (1990-2005).

5. Results, discussions and recommendation

The section analyzes and discusses the empirical results based on the estimation procedure described in the preceding above. The section also discusses the implications of devaluation and recommendations to policy makers. Finally, this section an impetus to areas of further research based on the results of this study.

5.1. Stationarity test results. Table 1 reports the results of the Phillips-Perron tests for unit root. The results show that all the variables are first difference, which means that they are integrated of order one, i.e. I(1). In performing the Phillips-Perron test, intercept and trend were included in test equation for all variables except for trade balance were only the intercept was required.

Table 1. Phillips-Perron test result

Variable	Level		1st difference	
	Intercept	Intercept and trend	Intercept	Intercept and trend
LTB	-0.792374		-3.650471*	
LRER		-4.088595		-12.84585*
LY		-1.654828		-3.785108**
LY*		-2.457353		-5.664493*

Notes: Asterisks * and ** shows significance at 1% and 5% levels respectively. [ ]denotes the p-value.

Test critical values: intercept and trend:	1% level	-4.115684
	5% level	-3.485218
	10% level	-3.170793
With intercept:	1% level	-3.538362
	5% level	-2.908420
	10% level	-2.591799

5.2. Cointegration results. Results of the Johansen-Juselius tests are shown in Table 2. Since the Johansen-Juselius test is quite sensitive to the lag length selected, the most commonly used criterions such as Akaike Information Criterion (AIC) and Schwarz Information Criterion (SIC) are utilised to determine the optimal lag length, all of which suggest that two lags be included (see Table 2 appendix). From the results it shows that both the trace test and the max-eigenvalue test indicate the existence of one cointegrating equation at the 5% level.

Table 2. Johansen cointegration results

Hypothesized No. of CE(s)	Trace statistic	0.05 critical value	Prob. **	Max eigenvalue	0.05 critical value	Prob. **
None*	53.10014	47.85613	0.0148	32.42367	27.58434	0.0110
At most 1	20.67646	29.79707	0.3781	15.32656	21.13162	0.2667
At most 2	5.349906	15.49471	0.7706	5.312826	14.26460	0.7019
At most 3	0.037080	3.841466	0.8473	0.037080	3.841466	0.8473

Notes: Both trace statistic and max eigenvalue test indicate one cointegrating equation(s) at the 0.05 level. *Denotes rejection of the hypothesis at the 0.05 level. **Mackinnon-Haug-Michells (1999) *p*-values.

The results show that the trace statistic of 53.10 is greater than 47.87 critical value at the 5% level indicating one cointegrating equation. The maximum eigenvalue also gives the same conclusion since 32.42 is greater than 27.58 at the 5% level. This means both tests reject the null hypothesis of no cointegration and shows the existence of one cointegrating equation at the 5% level.

The estimated cointegration vector is normalized in such a way to give a trade balance equation, i.e. coefficient on *LTB* is set to be 1. As the variables do cointegrate, we may now proceed and estimate the corresponding cointegrating equation, and the results read as follows.

$$\ln TB_t = 10.25 + 0.32\ln RER_t + 1.87\ln Y_t - 0.96Y_t^* + e_t$$

$$(6.37750)^* \; (5.79701)^* (8.56538)^*, \quad (6)$$

where ( ) denotes t values, *significant at 5% level. The estimates of the cointegrating trade balance equation 6 are used to get corresponding VECMs. A VECM is based on the cointegrating vector found with Johansen's procedure and the equation is as follows:

$$\Delta(LTB_t) = -0.0051 + 0.67\Delta LTB_{t-1} - 0.055\Delta LTB_{t-2} - 0.021\Delta LRER_{t-1} - 0.0086\Delta LRER_{t-2} - 0.063\Delta LY_{t-1} -$$

$$(0.58113) \quad (4.87147) \quad (-0.40300) \quad (-1.47626) \quad (-0.72461) \quad (-0.19560)$$

$$-0.20\Delta LY_{t-2} + 0.31\Delta LY^*_{t-1} + 0.033\Delta LY^*_{t-2} - 0.14ECM_{t-1}$$

$$(-0.54601) \quad (0.37276) \quad (0.04025) \qquad (7)$$

where ( ) denotes t-values.

The misspecification tests for the long-run models are provided below.

LM test for serial correlation: 9.76 [0.8776]'

White heteroskedasticity test: χ^2 =536.07 [0.5396]'

Normality JBChol test: = 73.70 [0.0000]'

[ ] denotes p-value.

6. Discussion of results

Equation 6 shows that the t values for all the three explanatory variables are significant at the 5% level and explains the dependent variable. The results show that trade ratio is positively related to the real effective exchange rate with an elasticity of 0.32, which means 1% real devaluation improves the trade balance by 0.32%. The implication of this relationship is that real devaluation will improve trade ratio in the long run. The results support the empirical validity of the Marshall-Lerner condition, indicating that devaluation improved the trade balance in Zimbabwe over the sample period.

The positive sign on the domestic income shows that an increase of 1% in domestic income in Zimbabwe leads to an improvement of 1.87% in trade balance in the long run. The above then may imply that supply side factors have been important in driving output growth in Zimbabwe and consequently enhancing its export. This means exports will be increasing may be through production of import substitute goods.

Usually, the sign on the foreign income to trade balance should be positive. However, the result shows a negative sign on the foreign income (United States) which implies that a 1% rise in foreign income leads to a 0.96% decrease in Zimbabwe's trade balance. This may be because the rise in foreign real income is due to an increase in the foreign production of import-substitute goods, thus, their imports may decline as income increases.

The VECM results in equation 7 show that there is a very weak short run relationship between real exchange rate, domestic income and foreign income to trade balance. Only changes in the trade balance in the previous quarter affect trade balance in the short run. This means if the trade balance is higher this period, it is likely to be higher in the next quarter. The size of the adjustment parameter 0.14 suggests a slow adjustment process to a deviation from equilibrium. If there is a shock that results in disequilibrium, trade balance would adjust by 14% each quarter or it takes close to 8 quarters (2 years) to attain equilibrium.

The misspecification test results for the residuals shows that the variables in the model do not suffer from serial correlation and heteroskedasticity (Table 5 and 6 in the appendix). The LM test, has t-statistic of 9.76 and a probability of 0.8776. Given that the p-value is greater than 0.5, we fail to reject the null hypothesis of no serial correlation and conclude that the variables are not correlated. The heteroskedasticity test gives a chi-squared statistic of 536.07, which means that the variables do not suffer from heteroskedasticity.

However, the Jarque-Bera test statistic of 73.70 means that it is significant hence the null hypothesis of normal distribution is rejected at the 5% level (Table 7 in appendix).

6.1. J-curve effect. Impulse response function provides information about the short-term responses for trade balances. To test whether J-curve effects exist in Zimbabwe, we examine the impulse response of the trade ratio to one standard deviation shock in the real exchange rate in Zimbabwe. It can clearly be observed from Figure 1 that the response of trade balance to devaluation has not shown a J-shape, indicating that J-curve effects do not exist in Zimbabwe. This means that if there is a 1% shock, the trade balance does not worsen first and then improves several periods later. Instead, after a shock, trade balance sharply increases and overshoots the long run equilibrium to a maximum of about 3.5% and then starts to decrease but still positive. Thus, J-curve hypothesis is invalid for the Zimbabwe case over the sample period.

This result is consistent with the empirical work for different set of countries as reported by Rose and Yellen (1989), Baharumshah (2001), Akbostanci (2002), Ahmad and Yang (2004), Gomez and Alvarez-Ude (2006), suggesting no evidence of J-curve effects.

The reason why devaluation failed to realize the intended benefits was that Zimbabwe produce and export most products as primary produce whose response to price is very low. Zimbabwe on the other hand, imports most of her industrial input requirements. So, the impact of devaluation will be immediate cost push hence high inflation.

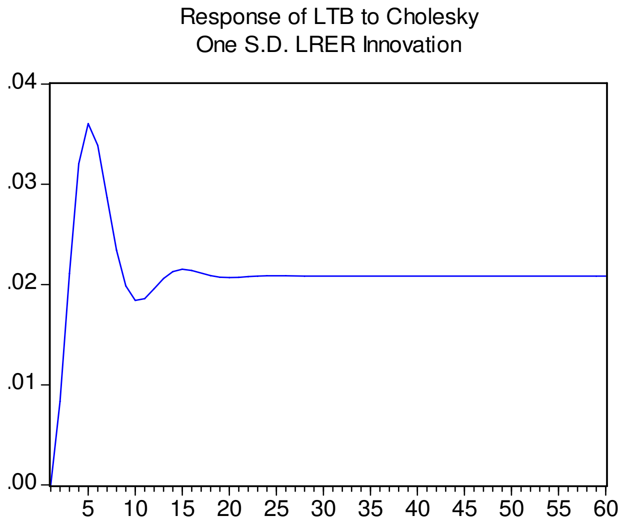

Fig. 1. Impulse response function

Recommendations

In order to achieve the desired effects on trade balance, Zimbabwe should depend on policies that focus on the variable of real exchange rate, which is the nominal exchange rate to aggregate price level. At the same time, the devaluation-based policies (affected through changes in nominal exchange rate) must cooperate with stabilization policies (to ensure domestic price level stability) to achieve the desired level of trade balance.

However, devaluation-based policies also cause some problem. Devaluation-based policies would cause increases in the cost of imports which leads to increased cost of production since you require more local currency to import the same quantity than before. This might lead to import inflation that can negatively affect domestic firms that use imported inputs. In situations where devaluation is accompanied by inflation in the domestic market, it erodes purchasing power of money (real balance effect) resulting in a decline in aggregate demand. This was witnessed during the period under review when Zimbabwe experienced higher levels of inflation when the local currency was continuously devalued.

Besides that, devaluation-based policies may not be effective in improving trade balance if other countries also apply the devaluation-based policies at the same time. On the other hand, the countries should implement the policies that focus on the production of import-substituted goods. Import-substitution policy may work well in improving domestic income and trade balance.

Researchers interested in extending this study should try to investigate the response of other variables in the model to a real devaluation, such as inflation, prices of imports and wages and interest rate. Future research should try to use bilateral trade data to investigate the J-curve to capture the competitive aspect of the real exchange rate compared to real effective exchange rate.

Conclusion

This study employed the Johansen-Juselius cointegration analysis and VECM model to investigate the Marshall-Lerner condition and J-curve effect on the trade balance in Zimbabwe. The results show that real devaluation has a long-run positive impact on the trade balance in Zimbabwe which confirms the Marshall-Lerner condition. The results are further confirmed through the empirical work reported by Baharumshah (2001). The empirical work for different set of countries that reported by Shirvani and Wilbratte International Journal of Business and Management August, 2008 (1997), Sugema (2005), Akbostanci (2002) and Thorbecke (2006) also suggested Marshall-Lerner condition exists.

However, given the long-run positive relationship between the trade balance and real exchange rate in Zimbabwe, the empirical results using impulse response functions did not exhibit a J-curve pattern. Thus the J-curve effect does not apply to the Zimbabwean economy during the period under review. Since Zimbabwe is a small country and can not affect world prices and incomes, it is a price taker on international markets. Zimbabwe, apart from increasing competitiveness of exports through devaluating the local currency, can undertake policies that improve domestic production such as value addition and import substitution. This in some extent could contribute to market local product at a reasonable cost.

Reference

1. Ahmed, J. (1984). Floating exchange rates and world inflation, M'cmillan Press, Montreal.
2. Alse, J., Oskooee, B. (1995). "Do Devaluations improve or worsen the terms of trade?" *Journal of Economics Studies*, 22.

3. Akbostanci, E. (2002). Dynamics of the trade balance: the Turkish J-curve. Economic research center working papers in economics.
4. Baharumshah, A.Z. (2001). “The effect of exchange rate on bilateral trade balance: New evidence from Malaysia and Thailand”, *Asian Economic Journal*, Vol.15 (3).
5. Bahmani-Oskooee, M. (1998). Are Devaluations Contractionary in LDCs? *Journal of Economic Development*, Vol. 23.
6. Bahmani-Oskooee, M. (1985). “Devaluation and the J-curve: some evidence from LDCs”, *The Review of Economics and Statistics*, 67.
7. Brissimis, S.N., Leventakis, J.A. (1989). “The effectiveness of devaluation: a general equilibrium assessment with reference to Greece”, *Journal of Policy Modelling*, 11 (2).
8. Dornbusch, R., Fisher, S. (1992). Macroeconomics, 6th Edition, McGraw-Hill, Tokyo.
9. Gligoric, M. (2009). “Exchange Rate and Trade Balance: J-curve Effect, University of Belgrade, Serbia, Enders, E. (2004). *Applied Econometric Time Series* (2nd ed.) New Jersey: John Wiley & Sons.
10. Gujarati, D. (1995). Basic Econometrics, 3rd Edition, McGraw Hill Inc.
11. Junz, H., Rhomberg, R. (1973). Price Competitiveness in Export Trade Among Industrial Countries, *American Economic Review*, 67.
12. Hatemi-J., A., Irandoust, M. (2005). Bilateral Trade Elasticties: Sweden Versus Her Major Trading Partners.
13. Kamoto, B. (2006). “The J-Curve Effect on the Trade balance in Malawi And South Africa”, The University Of Texas, Arlington, USA.
14. Miles, A. (1979). “Effects of Devaluation on Trade and Balance and the Balance of Payment”, *Journal of Political Economy*, Vol. 87, No. 3.
15. Mafusire, A. (1992). Effects of Devaluation on fiscal deficits in Zimbabwe, University of Zimbabwe.
16. Muhammad, A. (2011). “Impact of Devaluation on Trade Balance in Pakistan”, *Economics of Knowledge*, Vol. 3.
17. Miles, M.A. (1979). The Effects of Devaluation on the Trade Balance and the Balance of Payments.
18. Narayan Paresh (2004). New Zealand’s Trade Balance: Evidence of the J-Curve and Granger Causality, *Applied Economics Letters*, 11.
19. Onafowora, O. (2003). Exchange rate and trade balance in East Asia: Is there a J-curve, *Economic Bulletin*, Vol. 5, No. 18.
20. Reinhart, C. (1995). Devaluation, Relative Prices and International Trade: Evidence from Developing Countries, *IMF Staff Papers*, Vol. 42.
21. Reserve Bank of Zimbabwe Publications, Monetary Policy Statements, Various issues for Period 1990 to 2005.
22. Rose, A.K. (1991). The role of exchange rates in a popular model of international trade, Does the Marshall Lerner condition hold, *Journal of International Economics*, 30.
23. Rose, A., Yellen, J. (1989). “Is there a J-curve?” *Journal of Monetary Economics*, 24.
24. Salvatore, D. (2007). International Economics. Hoboken: John Wiley & sons.
25. Shirvani, H. & Wilbratte, B. (1997). The relationship between the real exchange rate and the trade balance: An empirical reassessment, *International Economic Journal*, Vol. 11.
26. Sugema, I. (2005). The determinants of trade balance and adjustment to the crisis in Indonesia. Centre for international economics studies, No.0508.
27. Shostak, F. (2007). Currency devaluation and economic growth, Applied Austrian School Economics Ltd.
28. Taylor, L. (1979). Macro Models for Developing Countries, New York: McGraw-Hill.
29. Thorbecke, W. (2006). The effect of exchange rate changes on trade in East Asia. RIETI Discussion Paper Series.
30. Upadhyaya, K. (1999). Currency devaluation, aggregate output, and long run: an empirical study, *Economics letters*, 64.
31. Yiheyis, Z. (2006). “The Effects of Devaluation on Aggregate Output: Empirical Evidence from Africa”, *International Review of Applied Economics*, 20 (1).
32. Yuen-Ling, N. (2008). “Real Exchange Rate and Trade Balance Relationship: An Empirical Study on Malaysia”, *International Journal of Business and Management*, Vol. 3.

Appendices

Table 1. Phillip Peron unit roots test results

Variable	Level		1st difference	
		Intercept and trend	Intercept	Intercept and trend
LTB	-0.792374 (0.8143)		-3.650471* (0.0067)	
LRER		-4.088595** (0.0106)		-12.84585* (0.0000)
LY		-1.654828 (0.75940)		-3.785108** (0.0240)
LY*		-2.457353 (0.3477)		-5.664493* (0.0001)

Test critical values: intercept and trend:	1% level	-4.115684
	5% level	-3.485218
	10% level	-3.170793
With intercept:	1% level	-3.538362
	5% level	-2.908420
	10% level	-2.591799

Notes: Asterisks * and **show significance at 1% and 5% levels respectively. ( ) denotes the *p*-value.

Table 2. Lag selection criteria results

VAR Lag order selection criteria						
Endogenous variables: LTB LRER LY LY1						
Exogenous variables: C						
Date: 09/18/12 Time: 19:46						
Sample: 1990Q1 2005Q4						
Included observations: 59						
Lag	LogL	LR	FPE	AIC	SC	HQ
0	135.2712	NA	1.37e-07	-4.449870	-4.309020	-4.394888
1	480.9738	632.8116	1.92e-12	-15.62623	-14.92198	-15.35132
2	528.8396	81.12848	6.59e-13*	-16.70643*	-15.43878*	-16.21159*
3	537.4315	13.39759	8.64e-13	-16.45531	-14.62426	-15.74054
4	556.9732	27.82200*	7.96e-13	-16.57536	-14.18091	-15.64067

Notes: *indicates lag order selected by the criterion. LR: sequential modified LR test statistic (each test at 5% level). FPE: Final prediction error. AIC: Akaike information criterion. SC: Schwarz information criterion. HQ: Hannan-Quinn information criterion.

Table 3. Johansen-Juselius cointegration results

Date: 09/18/12 Time: 19:50				
Sample (adjusted): 1990Q4 2005Q4				
Included observations: 61 after adjustments				
Trend assumption: Linear deterministic trend				
Series: LTB LRER LY LY1				
Lags interval (in first differences): 1 to 2				
Unrestricted cointegration rank test (trace)				
Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical value	Prob.**
None *	0.412298	53.10014	47.85613	0.0148
At most 1	0.222176	20.67646	29.79707	0.3781
At most 2	0.083410	5.349906	15.49471	0.7706
At most 3	0.000608	0.037080	3.841466	0.8473
Unrestricted cointegration rank test (Maximum eigenvalue)				
Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical value	Prob.**
None *	0.412298	32.42367	27.58434	0.0110
At most 1	0.222176	15.32656	21.13162	0.2667

Table 3 (cont.). Johansen-Juselius cointegration results

Unrestricted cointegration rank test (Maximum eigenvalue)				
At most 2	0.083410	5.312826	14.26460	0.7019
At most 3	0.000608	0.037080	3.841466	0.8473

Notes: Trace test indicates 1 cointegrating eqn(s) at the 0.05 level. Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level. * denotes rejection of the hypothesis at the 0.05 level. **MacKinnon-Haug-Michelis (1999) *p*-values.

Table 4. Vector error correction results

Vector error correction estimates				
Date: 09/18/12 Time: 19:52				
Sample (adjusted): 1990Q4 2005Q4				
Included observations: 61 after adjustments				
Standard errors in ( ) & t-statistics in [ ]				
Cointegrating equation	Cointegrating equation 1			
LTB(-1)	1.000000			
LRER(-1)	-0.318576			
	(0.04995)			
	[-6.37750]			
LY(-1)	-1.865711			
	(0.32184)			
	[-5.79701]			
LY1(-1)	0.959179			
	(0.11198)			
	[8.56538]			
C	10.25227			
Error correction:	D(LTB)	D(LRER)	D(LY)	D(LY1)
CointEq1	-0.137822	1.672220	0.061978	-0.007009
	(0.04923)	(0.61327)	(0.02013)	(0.00782)
	[-2.79945]	[2.72674]	[3.07961]	[-0.89586]
D(LTB(-1))	0.667302	0.263970	0.056119	0.016658
	(0.13698)	(1.70634)	(0.05600)	(0.02177)
	[4.87147]	[0.15470]	[1.00218]	[0.76519]
D(LTB(-2))	-0.055008	-0.187353	-0.054116	-0.016984
	(0.13650)	(1.70030)	(0.05580)	(0.02169)
	[-0.40300]	[-0.11019]	[-0.96986]	[-0.78293]
D(LRER(-1))	-0.020508	0.076153	0.009346	-0.000707
	(0.01389)	(0.17304)	(0.00568)	(0.00221)
	[-1.47626]	[0.44008]	[1.64587]	[-0.32032]
D(LRER(-2))	-0.008557	-0.091740	0.001646	0.001960
	(0.01181)	(0.14710)	(0.00483)	(0.00188)
	[-0.72461]	[-0.62367]	[0.34094]	[1.04435]
D(LY(-1))	-0.062521	-0.228877	0.777983	0.055903
	(0.31964)	(3.98163)	(0.13066)	(0.05080)
	[-0.19560]	[-0.05748]	[5.95406]	[1.10047]
D(LY(-2))	-0.199993	4.848250	0.038069	-0.100954
	(0.36628)	(4.56264)	(0.14973)	(0.05821)
	[-0.54601]	[1.06260]	[0.25425]	[-1.73426]
D(LY1(-1))	0.306207	-14.16498	-0.315059	0.202402
	(0.82146)	(10.2327)	(0.33580)	(0.13055)
	[0.37276]	[-1.38429]	[-0.93822]	[1.55036]
D(LY1(-2))	0.033478	-2.871753	-0.046007	0.342675
	(0.83182)	(10.3617)	(0.34004)	(0.13220)
	[0.04025]	[-0.27715]	[-0.13530]	[2.59214]
C	-0.005127	0.156270	0.001756	0.003422
	(0.00882)	(0.10990)	(0.00361)	(0.00140)
	[-0.58113]	[1.42195]	[0.48685]	[2.44067]
R-squared	0.556154	0.254654	0.564725	0.255403

Table 4 (cont.). Vector error correction results

Cointegrating equation	Cointegrating equation 1			
Adj. R-squared	0.477828	0.123122	0.487912	0.124004
Sum sq. resids	0.051447	7.983015	0.008597	0.001299
S.E. equation	0.031761	0.395638	0.012984	0.005048
F-statistic	7.100520	1.936065	7.351922	1.943716
Log likelihood	129.3260	-24.53174	183.8939	241.5242
Akaike AIC	-3.912329	1.132188	-5.701441	-7.590959
Schwarz SC	-3.566284	1.478233	-5.355396	-7.244914
Mean dependent	-0.005787	0.021229	-0.002587	0.007518
S.D. dependent	0.043953	0.422502	0.018144	0.005393
Determinant resid covariance (dof adj.)		5.20E-13		
Determinant resid covariance		2.54E-13		
Log likelihood		538.3059		
Akaike information criterion		-16.20675		
Schwarz criterion		-14.68415		

Vector error correction model equation

$\Delta(LTB_t) = -0.0051 + 0.67\Delta LTB_{t-1} - 0.055\Delta LTB_{t-2} - 0.021\Delta LRER_{t-1} - 0.0086\Delta LRER_{t-2} - 0.063\Delta LY_{t-1} -$

[-0.58113] [4.87147] [-0.40300] [-1.47626] [-0.72461] [-0.19560]

$0.20\Delta LY_{t-2} + 0.31\Delta LY^{*}_{t-1} + 0.033\Delta LY_{t-2} - 0.14ECM_{t-1}$

[-0.54601] [0.37276] [0.04025],

where [·] denotes t-values.

Table 5. Serial correlation LM test results

VEC residual serial correlation LM tests		
H0: no serial correlation at lag order h		
Date: 09/18/12 Time: 19:57		
Sample: 1990Q1 2005Q4		
Included observations: 61		
Lags	LM-Stat	Prob
1	21.02709	0.1775
2	**9.784441**	**0.8776**
3	18.69172	0.2850
4	48.52278	0.0000
5	6.774466	0.9774
6	6.050936	0.9875
7	6.735219	0.9780
8	23.61747	0.0982
9	6.748492	0.9778
10	9.474860	0.8926
11	12.89662	0.6803
12	21.83215	0.1487
Probs from chi-square with 16 df.		

Table 6. Normality, Jarque Bera Cholesky test result

VEC Residual normality tests				
Orthogonalization: Cholesky (Lutkepohl)				
H0: residuals are multivariate normal				
Date: 09/18/12 Time: 19:58				
Sample: 1990Q1 2005Q4				
Included observations: 61				
Component	Skewness	Chi-sq	df	Prob.
1	0.817582	6.795811	1	0.0091
2	1.432322	20.85739	1	0.0000
3	-0.354464	1.277389	1	0.2584

Table 6 (cont.). Normality, Jarque Bera Cholesky test result

Component	Skewness	Chi-sq	df	Prob.
4	-0.107389	0.117247	1	0.7320
Joint		29.04784	4	0.0000
Component	Kurtosis	Chi-sq	df	Prob.
1	4.770542	7.967661	1	0.0048
2	6.566676	32.33299	1	0.0000
3	4.128929	3.239305	1	0.0719
4	2.337220	1.116497	1	0.2907
Joint		44.65645	4	0.0000
Component	Jarque-Bera	df	Prob.	
1	14.76347	2	0.0006	
2	53.19038	2	0.0000	
3	4.516694	2	0.1045	
4	1.233744	2	0.5396	
Joint	**73.70429**	**8**	**0.0000**	

Table 7. Hetereoskedasticity White test results

VEC Residual heteroskedasticity tests: includes cross terms					
Date: 09/18/12 Time: 19:59					
Sample: 1990Q1 2005Q4					
Included observations: 61					
Joint test:					
Chi-sq	df	Prob.			
536.0736	**540**	**0.5396**			
Individual components:					
Dependent	R-squared	F(54,6)	Prob.	Chi-sq(54)	Prob.
res1*res1	0.840058	0.583585	0.8645	51.24353	0.5814
res2*res2	0.945026	1.910036	0.2121	57.64657	0.3420
res3*res3	0.949631	2.094823	0.1778	57.92748	0.3325
res4*res4	0.764682	0.361063	0.9798	46.64561	0.7510
res2*res1	0.945331	1.921336	0.2097	57.66521	0.3413
res3*res1	0.792980	0.425605	0.9566	48.37175	0.6904
res3*res2	0.899764	0.997384	0.5667	54.88560	0.4408
res4*res1	0.905735	1.067594	0.5234	55.24981	0.4272
res4*res2	0.902455	1.027961	0.5475	55.04974	0.4347
res4*res3	0.922182	1.316714	0.3952	56.25307	0.3906

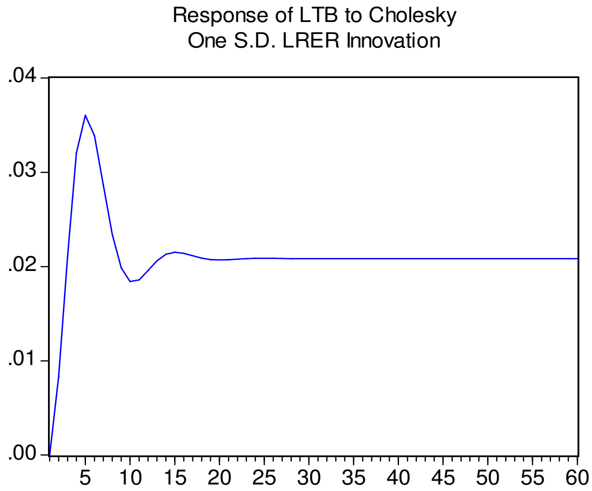

Fig 2. Impulse response of trade balance to real exchange rate