



**ZIMBABWE DOLLARISATION: SHORT TERM GIFT, LONG
TERM CURSE. REINTRODUCING THE ZIMBABWE
DOLLAR USING THE GOLD STANDARD**

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Abstract

Historical analysis suggests that in the short to medium term, dollarization as a monetary policy measure, post a period of high inflation, reduces economic volatility, stabilises the inflation of goods and services, and restores economic predictability. However, in fully dollarized economics (as opposed to dual currency economies,) in the medium term, the effects of dollarization do not create a suitable environment for long term sustainable growth. This paper discusses the benefits and challenges of full dollarization and suggests a further policy measure of re-introducing the local currency through a managed regime. The paper looks to smoothing out money supply volatility through Zimbabwe dollar introduction. Understanding the responsiveness of the economy to monetary liquidity is explained through theoretical and extrapolative statistical analysis derived from a short-range historic time series.

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1. INTRODUCTION

In terms of dollarized economies, Zimbabwe presents a unique example in that it is a fully dollarized economy, as opposed to most other examples which are dualised economies and maintain a local currency in circulation, albeit that it may have little confidence or value. Formal dollarization was implemented in February 2009 as a measure designed to contain inflation and restore economic predictability and confidence, post a period of high inflation and volatility. The background and context of this is explored to understand the causes of high de-facto dollarization in the 2000s leading to formal implementation of a multi-currency environment.

In an effort to explain the economic condition of a fully dollarized Zimbabwe, analysis is made of national economic indicators, which highlight the state of the economy pre and post dollarization. The data shows that pre-dollarization, economic volatility, measured through changes in GDP, was significantly higher than the period post implementation of a multi-currency regime. The results are not surprising as the short-term economic impact post formal dollarization, is well documented and will be explored further. However, we aim to understand the effect on the medium term; using Year 4 and Year 5 as our measure for 'medium' term (this is due to the subject country in question and the number of years under which the country has operated under dollarization). Within this period we witness a lack of growth in GDP, along with evidence of slowing inflation and explain some of the regional linkages.

This paper will highlight the constraints that exist within a dollarized economy that has limited links with the owner of the common currency. Findings suggest that the Zimbabwean economy has strong economic ties with Europe, South Africa and China and, to a lesser extent, the United States and former colonial parent Great Britain. This is evident through analysis of the relationship between price movements (Consumer Price Indices) and currency movements, which provide perspective on the relationship between the local economy and parent country. The results also give possible suggestion of a solution in terms of joining a common currency area (CCA), as well as also highlighting

possible risks of CCA in terms of inflation risk, and sovereign risk of the neighbour.

We will explore a suggested policy that entails the reintroduction of the Zimbabwe Dollar (ZWD) tied to a common commodity standard (gold), sourced locally. This policy could potentially facilitate an environment where measured monetary policy could provide the required economic confidence and support to restore interest rate discovery. This suggestion is made on the assumption that confidence in state institutions is restored. This paper creates and proposes a model to reintroduce the ZWD and shows the workings of possible dollarization along with increases in money supply which in effect should smooth Money Supply volatility. This policy measure would allow the central bank to reassume its other role of managing money supply through a decisive and independent monetary policy, reassuming its role of lender of last resort.

Due to the economic context of this paper, we briefly explore the political and legislative encumbrances that have challenged the possible economic reinvigoration of the Zimbabwean economy and those that caused economic compromise in the first place. This provides us with perspective on the drivers of currency liquidity and subsequently the lack thereof in the Zimbabwean context.

2. BACKGROUND: ZIMBABWE CURRENCY ENVIRONMENT

In order to understand dollarization and de-dollarization of the Zimbabwean economy one has to address how and why such drastic policy measures were implemented. We aim to do this by exploring how the Zimbabwean economy appeared at a point in time, and what possible measures would be needed to succeed rampant hyperinflation. This paper aims to present the most implicit causes of Zimbabwe's dollarization. It is impossible to avoid addressing the political context in explaining the rise of US dollar use in the Zimbabwean economy. Best measures are taken not to over politicise or create bias, the approach intended on this analysis is subjective; however, in explaining a possible solution some objectivity is required.

2.1. Historical Economic Performance and Policy from 1960

Post the Unilateral Declaration of Independence (UDI) in 1965, sanctions were imposed on Rhodesia, and the then government's response was to foster a policy of self-sufficiency, where large scale investments were made which promoted the diversification of the Zimbabwean economy. However during this period to 1980, the liberation struggle intensified and growth measured through GDP declined. After independence, Zimbabwe experienced economic growth greater than the rest of Sub-Saharan Africa at an average of 5.5% from 1980 to 1990.¹ This was influenced by favourable domestic and external conditions, including the lifting of economic sanctions, stimulation of overall demand in the economy with redistributive fiscal policies, and the opening up of external markets. Thereafter, towards the end of 1990s, growth was characterized by periods of economic booms and busts corresponding to periods of good weather or severe drought (AFDB, 2010).

¹ Bloomberg Data

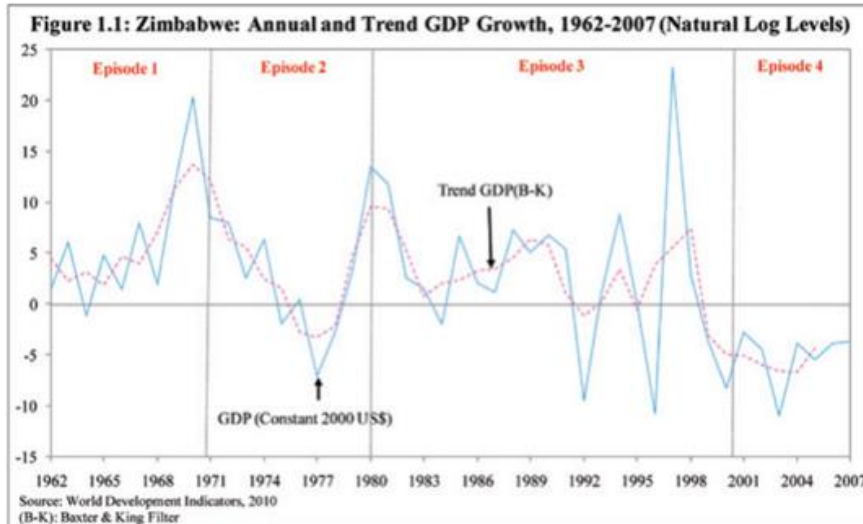


Figure 1 Source AFDB, 2010

At the end of the 1990s, economic performance began to wane, partly due to internal policy inconsistencies. The period was characterised by low investment, declining manufacturing production, and rising unemployment, along with foreign exchange shortages (AFDB, 2010). Between 1989 and 2000 three major economic events took place. Firstly, the Economic Structural Adjustment Programs (ESAP) promoted by the IMF and World Bank saw the government dispose of a number of state owned assets, which at the time made significant contributions to the state coffers. Secondly, the unplanned balloon payment of ZWD50, 000 to 300,000 war veterans, and lastly, the policy of land appropriation which resulted in violent farm invasions across the country. All these put a significant strain on an already expanding budget deficit and are the most fundamental causes of Zimbabwe's "lost decade".² Additionally, further impacts included lost foreign investment, withdrawal of foreign aid, and lower tax revenues.

² Lost Decade: Used to describe the period between 2000 and 2009 where Zimbabwe GDP fell 51% to levels last experienced in 1952.

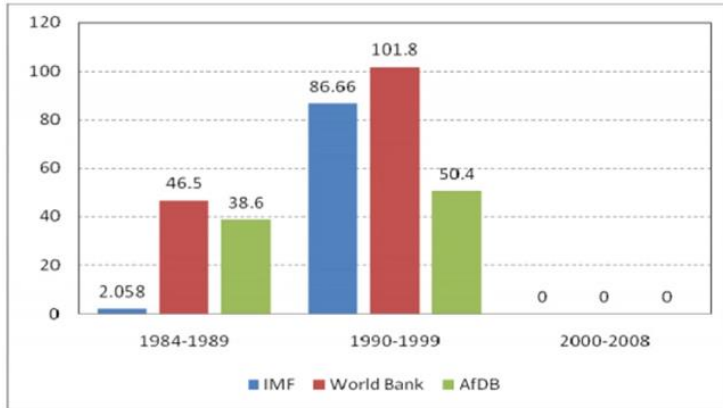


Figure 2: Disbursement by Multilateral Financial Institutions

Source RBZ 2012

The political discourse around this time shows a number of commentators according blame to gross economic mismanagement which arguably had implications on foreign investment perceptions, precipitating into further economic decline, as indicated in Figure 2.

Between 2000 and 2009 the economic contraction escalated. Zimbabwe's economic crisis was so deep that it set the country back more than half a century. To illustrate this, in 1950s the then-Southern Rhodesia had an average income of \$760 per year (in constant 1990 US\$ at purchasing power parity rates) by mid-2005 the average Zimbabwean income had fallen back to that level, wiping out the income gains over the past 52 years (Clemens and Moss, 2005).

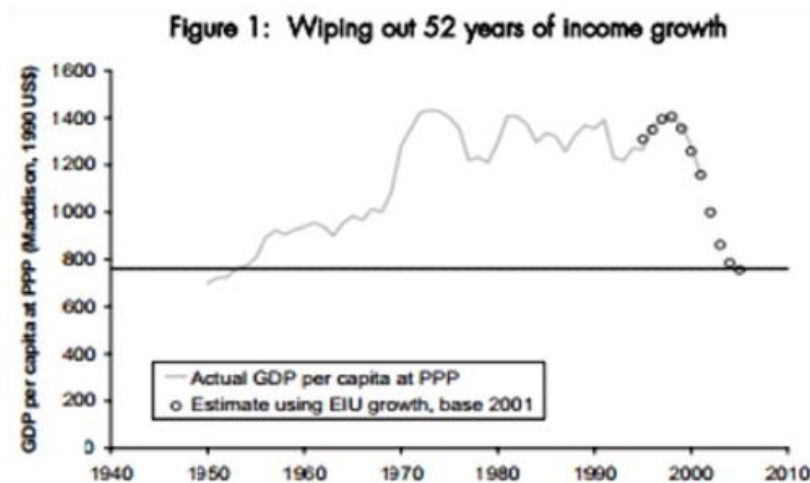


Figure 3 Source, CGDEV 2005

With lower tax revenues, failing manufacturing, and exports that declined by half within the period, the Reserve Bank repeatedly devalued the ZWD. This was further fuelled by the governments reliance on the monetary machine to subsidise its deficit gap. Zimbabwe recorded inflation increases of 231 million percent in July 2008, the highest ever recorded level of inflation. Added to that was the depletion of Zimbabwe's educated workforce, as many emigrated in search of better living conditions and incomes.

The role of the agricultural sector needs to be highlighted to explain Zimbabwe's economic collapse and the rise of dollarisation as it is directly related to the context of this paper. Agricultural exports were historically the largest contributor to the current account. Zimbabwe was often referred to as the "bread basket of Africa", due to the fact that the country, since independence, was a net exporter of food commodities. In addition, this sector historical employed over 60% of the population - a figure that still stands today. The financial sector was heavily exposed to the agro-economy, through wage deposits, asset leasing and financing, and mortgage lending. As agricultural productivity declined, so did financial sector performance.

2.2. Time inconsistency and lack of credibility of monetary policy

As with Latam countries, time inconsistency of the reserve bank can partly account for defacto dollarisation that occurred pre-policy implementation. The systematic use of monetary surprise as a means of both promoting economic activity and reducing the real value of public debt, eroded the credibility of monetary policy, arguably keeping Zimbabwe in a high inflation environment (Kydland and Prescott 1977; Calvo 1978). Abuse of the exchange rate system along with sharp depreciation of the Zimbabwe dollar generated an additional reason to hold US dollars (Licandro and Licandro, 2003). Thus commenced the process of defacto dollarisation.

2.3. Financial Sector

Since the formal introduction of multiscurrency inflation has come under control, speculative activities in financial markets have abated, and the predictive ability of investors has been restored. Growth since dollarisation measured as Real GDP has improved from low base, however many economic challenges remain, some which mimic the environment between 2003 – 2009. Both periods (pre and post multicurrency system) experienced the following challenges; lack of fiscal space, liquidity shortages, and indiscipline in the banking sector (RBZ, 2012).

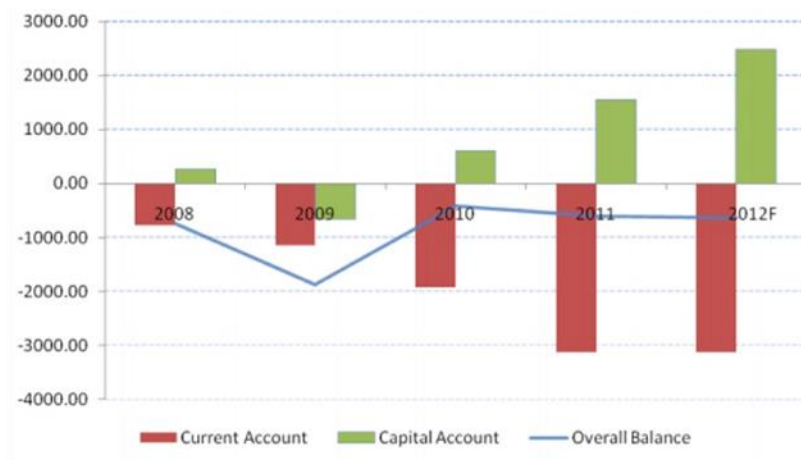


Figure 4 Source. RBZ and Zimstats 2012

Due to low capacity utilisation measured at 50% in 2011 and a lack of long term capital commitments, Zimbabwe has become increasingly import dependent (RBZ, 2012). An inability to respond to shocks such as droughts, continues to add strain to the current account deficit as imports rise in order to compensate for low domestic production. Furthermore, the capital account gains are insufficient to offset the deterioration in balance of payments, meaning that the domestic economy is starved of foreign exchange which impacts deposit and credit growth. (RBZ, 2012)

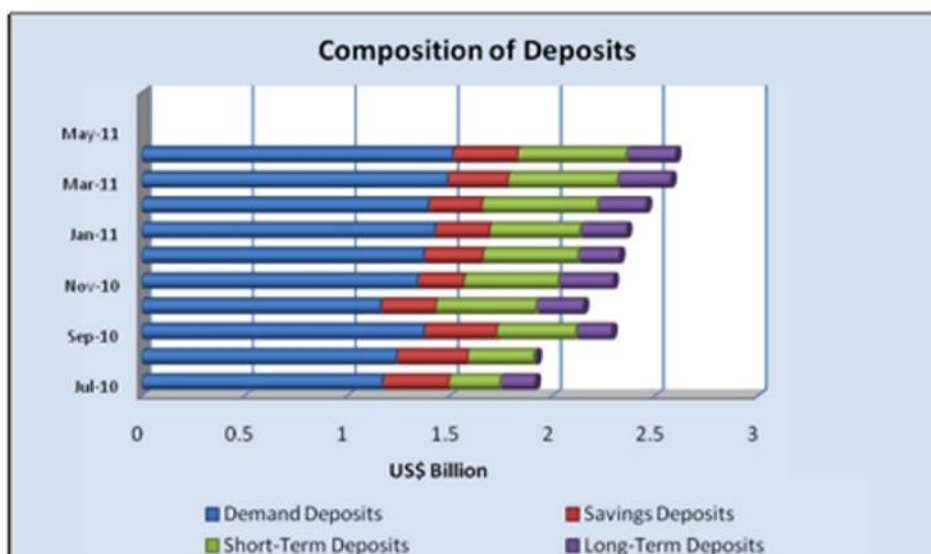


Figure 5 Source - Ministry of Finance Zimbabwe, 2011

While loan growth continues to rise, deposits remain volatile with short term deposits accounting for 90% of all deposits, as indicated in Figure 5 above. This can partly be explained by a lack of trust in financial institutions and the Reserve Bank of Zimbabwe (RBZ), but also the nature of the economy suggests that funds are used mainly for consumption rather than savings, thus deposits rarely spend a long time in the bank (Noko, 2011). In addition, interest rates offered by financial institutions are not providing enough of an incentive for savers, with further disincentives created by high banking fees.

Liquidity, as a key theme of this paper, needs to be historically contextualised. There are numerous reasons for the demise of Zimbabwe's financial economy. In explaining the cause of the demise, some suggest political uncertainty, economic mismanagement, lack of financial reserves, a broken institution of contract and rights to property, or inconsistent monetary policy. This sets the stage for limited foreign inflows and portfolio investment inflows, limited domestic use of financial institutions, a non-existent money market used as the base for interest discovery, and low economic confidence. Thus, the Zimbabwean economy is at the whim of external factors. The Global Financial Crisis (GFC) also had a significant impact, with a considerable amount of Zimbabweans (*est 3 million*) now living in the developed world. Diaspora remittances have become crucial

for domestic economic performance and subsequently offshore economic outcomes fuel a weak liquidity environment – for instance in the case of low economic performance in developed Europe.

Within the banking sector there has been disconcertance in deposit and lending rates which serves more as a disincentive to deficit and surplus economic units. A missing lender of last resort further promotes irregular interest rate conditions. Large banks have been quoting deposit rates ranging from 0.15% to 6%, with smaller banks quoting rates of between 8 and 16% (RBZ, 2012). Lending rates similarly range from 5 – 35% for individuals and corporates, bank charges also remain high making saving unattractive (RBZ, 2012).

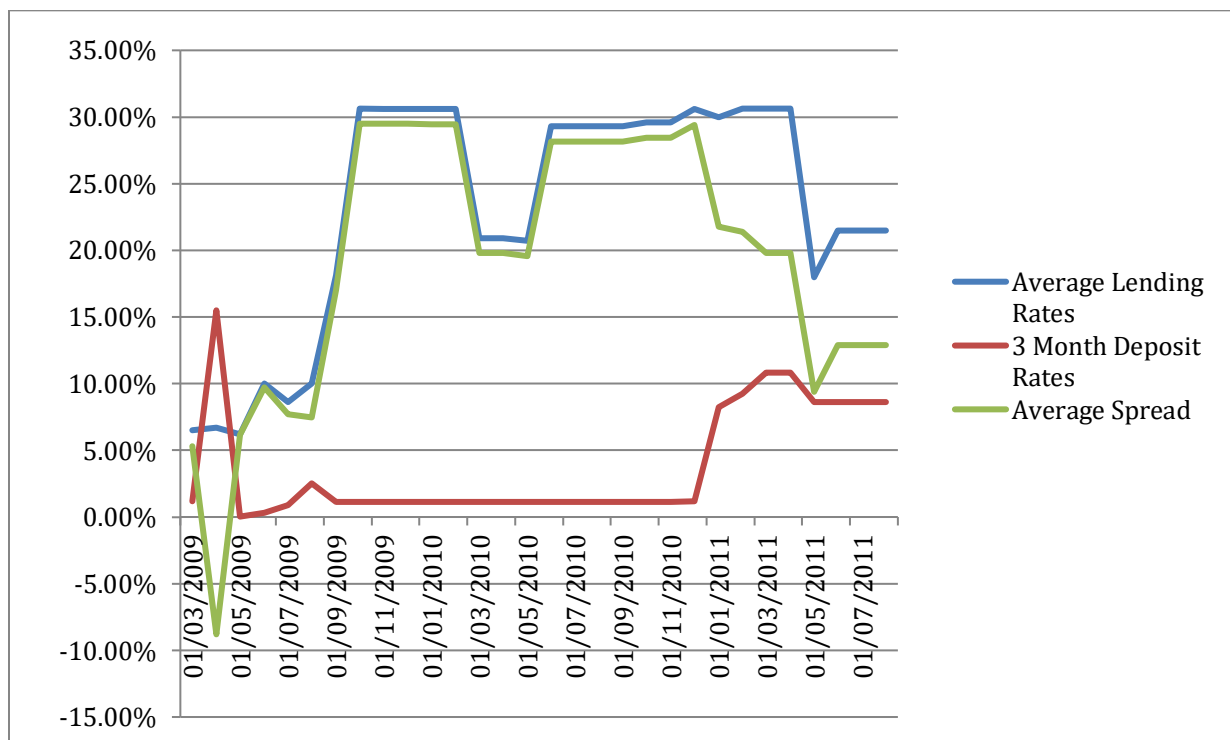


Figure 6: Average Lending Rates and 3 Month Deposit Rates and Average Spread

Source. RBZ, Interims Monetary Policy Statement Updates 2009 - 2011

Although the overall banking sector sees small improvements, this has not translated into economic gains. Established big business captures most of the lending market with loan

criteria being short term in nature and dependent on stability of applicant cashflows. Unless the value of a physical asset can be accurately ascertained, banks are generally reluctant to accept it as collateral. This means that the middle space, such as small to medium enterprise cannot access capital funding that facilitates growth and expansion. This creates a gap in the market which has subsequently been filled by micro-lenders, who typically have lower information requirements and charge much higher lending rates over short timeframes. To date there have been 172 microlending registrations. Presently the sector is under scrutiny, with incidence of rates as high as 50% per month being charged by some microfinance institutions. Aside from creating a highly indebted domestic economy, due to the moral hazards present in unbalanced economies, microlending also contributes to the illiquid nature of the economy. It does this by not creating savers, with high incidence of borrowings being used for consumptive and subsistence purposes, rather than wealth or capital formation.

2.4. Short-Run Effects of Dollarisation in Zimbabwe

Consumer Price Index 1980 -2012

As mentioned earlier, Zimbabwean inflation prior to formal dollarisation reached phenomenal levels along with a similar experience in price volatility levels. We identify three periods which reflect consumer price performance and which provide evidence that post dollarisation trend volatility, as measured by quarterly rolling changes in CPI, has declined.

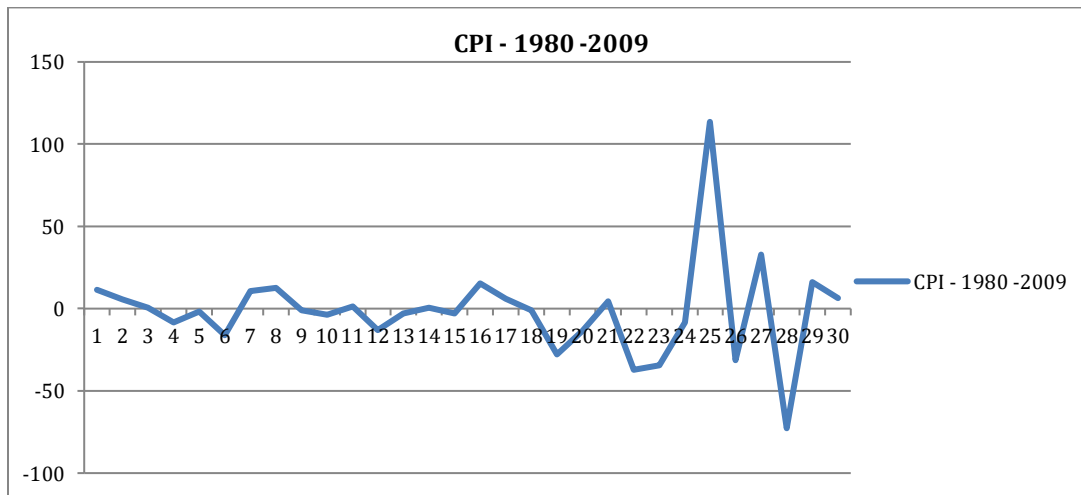


Figure 7: 1980 – 2009 Source. Bloomberg Data

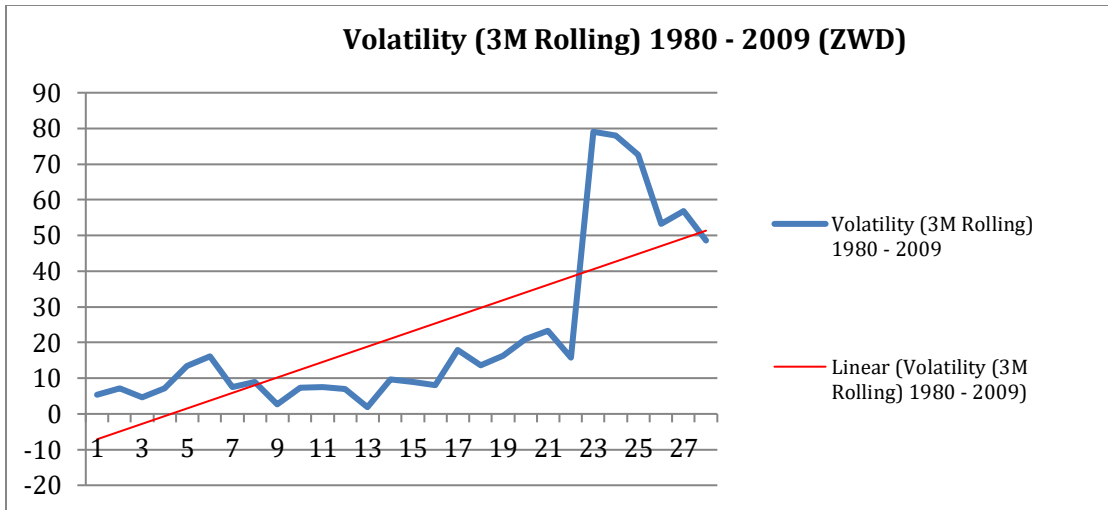


Figure 8 Source Data. Source. Bloomberg Data

2009 -2012

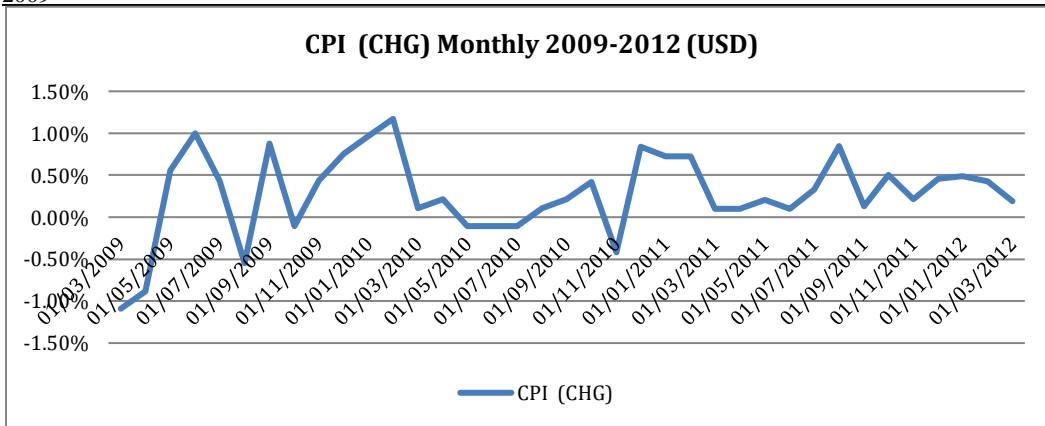


Figure 9 Source Data. Source. RBZ, Interims Monetary Policy Statement Updates 2009 – 2011,2012

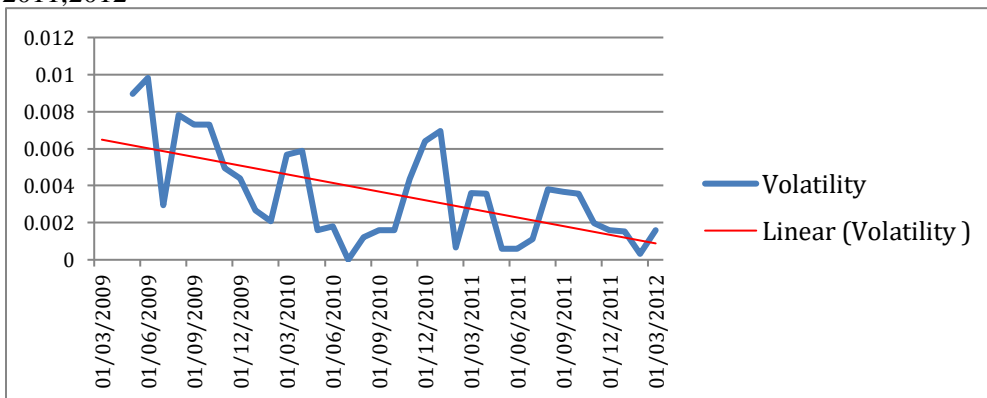


Figure 10 Source Data. Source. RBZ, Interims Monetary Policy Statement Updates 2009 – 2011,2012

The data clearly illustrates that under dollarisation inflation movements have been less aggressive than in periods where the ZWD was in use. Dollarisation could account for the renewed stability as this was the most significant policy measure during the period.

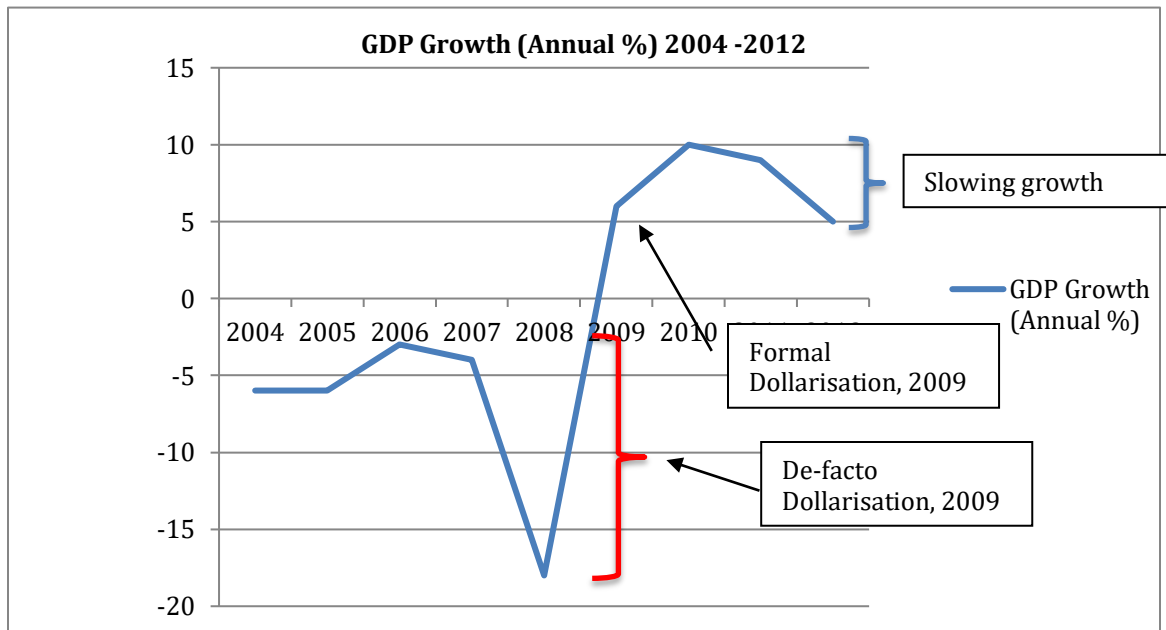


Figure 11 GDP Growth since 2009

Analysis of the above graph illustrates the rise of GDP growth during two specific periods. The first is before formal dollarisation, where economic units pre-empted the policy shift and uncontrollable inflation pushed them toward the use of the other currency. Further rises are seen post the implementation of dollarisation. Of greater relevance is the tapering off of growth in the dollarised environment.

Money Supply and Inflation

In the Zimbabwean environment, money supply explained very little movement in inflation. We conducted a regression analysis using monthly changes inflation as the dependent variable and M3 Money supply as the independent variable – the result is an R-Square of 0.125. The test result indicates significance at 95% confidence level.

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	0.653901891	0.028163641	23.21794621	7.57E-23
X Variable 1	-0.33922274	0.151538861	-2.238519773	0.031647

Table 1 Source Data – RBZ Monthly Bullitens



Figure 12 Stock Market Performance 2009 -2013 (Post Dollarisation) Bloomberg Data

The graph above illustrates that the market has increased 5-fold since the introduction of multi-currencyism. Further supporting the argument of stability created by dollarisation. Some confidence can be assessed to have returned to the stock market – with the ability to assess valuations of companies in semi stable environment. Prior this period (2009 - 2012) the levels of inflation are not reliable enough to accurately show market performance or listed company valuation metrics.

2.5. Bringing Back the Zimbabwe Dollar

Both the governor of the RBZ and the Minister of Finance concede that the current financial sector conditions are not satisfactory, though in hindsight dollarising was the most suitable policy measure. They both agree that a new order is required to ensure the continued recovery of the economy, but a stand-off exists on which policy measure will follow the present. The options that exist include; keeping the multicurrency regime and

fully dollarising, joining the Southern African Currency Union (SACU), waiting for a regional currency, and reintroduce the Zimbabwe dollar (Ministry of Finance, 2012).

This paper supports the reintroduction of the ZWD through an asset backed refloat where Zimbabwe uses its gold royalties as a reserve upon which the ZWD are issued as legal tender. It must be stated that this paper is not suggesting the withdrawal of US dollars from circulation but rather the addition of Zimbabwean dollars that are backed by gold. The immediate question that arises is the volatility of the gold price, which will impact the value of the reserves. We propose a market related derivative strategy that is a barrier or collared option as this will protect the value of gold reserves within a range set by administrators. The second question is the relationship between increased money supply and inflation. This paper will look at the relationship between money supply, production demand, and inflation; arguing that if productive demand exists in excess then increases in money supply will be adequately absorbed by economic production needs. Thus theoretically having a net neutral effect on broad inflationary outcomes. Finally, the paper will discuss how bringing back the Zimbabwe dollar and creating a transparent and liquid interest rate and exchange rate environment will lead to de-dollarisation and improvements in economic prospects resulting in improved possibilities of economic growth.

Again the biggest impediment to these suggestions will be the prevailing political environment which observationally is little equipped to implement such policy based on past irrationality. The model we build here leaves a small role for the Reserve Bank and because reserves are exposed to public markets, there can be no recourse to them by government that needs to sustain its expenditure, as was historically the case. This is the greatest point of contention and we are optimistic that this theoretical strategy can foster change even in the face of questionable political leadership.

3. RESEARCH FRAMEWORK

3.1. Research Objective

The objective of this research is to understand what constitutes an illiquid financial economy. The research aims to understand and show the impact of returning to a local currency standard, giving it a basis of trust through the use of a gold standard, allowing the economy to recover without overly impacting economic volatility. In other results, we seek to identify the relationship between the Zimbabwean economy and the economy of its neighbours by tracking the changes in inflation and growth. We also make comparison to a number of economies, highlighting the close relationship the ZWD has with the South African Rand (ZAR). We explore what the implication is of this relationship in a dollarized environment.

3.2. Research Question

Will reintroducing the Zimbabwe Dollar using a gold commodity standard improve the liquidity environment in Zimbabwe?

3.2.1. Sub Research Questions

- 3.2.1.1. Has financial dollarization increased economic volatility in Zimbabwe?
- 3.2.1.2. To what extent is inflation in Zimbabwe determined by price movements in neighbouring countries?
- 3.2.1.3. Will increases in money supply impact inflation in a Zimbabwe context?
- 3.2.1.4. Can a barrier option protect against the effects of spot price volatility of a reserve of gold?

3.3. Research Relevance

By identifying the weaknesses in the dollarized or multi-currency environment – this research hopes to present a sustainable response which could reinvigorate economic growth in Zimbabwe.

- 3.3.1. Relevance of this research is to identify weaknesses in the Zimbabwean financial economy that have the effect of increasing economic volatility.
- 3.3.2. The levels of illiquidity are important in explaining the short-coming of financial intermediaries in funding the countries' economic agent needs.
- 3.3.3. The effect of increased money supply or lack there off is important to understand and is extremely relevant when implementing a policy of money supply reform and its subsequent impact on local inflation.
- 3.3.4. As the use of a hedge has not been previously attempted, understanding the dynamics of the barrier option within the context of a commodity backed currency becomes extremely important.

3.4. Hypothesis

The research is informed by the following hypotheses;

- 3.4.1. In the short term dollarization limits price volatility, restoring economic stability and predictability, as illustrated earlier in the volatility analysis.
- 3.4.2. In the long term, full dollarization is ineffective in facilitating a liquid enough environment to meet the credit needs of a country, especially if there are limited economic links between the adopting country and the parent - in this instance Zimbabwe and the US. Use of the Rand may be better option based on the data analysis.
- 3.4.3. Gold backed currency environments reflect long periods of price stability and economic stability. As gold is a finite resource, the rate of growth of gold production should ideally match economic growth (this is if gold is produced locally). When economic growth surpasses gold production,

money supply becomes constrained which can have deflationary effect on an economy when the peg is removed.

- 3.4.4. Barrier options can be used to protect the value of a physical asset by ensuring that positive or negative movements in the gold price are covered. Barrier options ensure that underlying value of the asset remains the same. The nature of this allows for real-time policy adjustments to take immediate effect.

4. LITERATURE REVIEW

Zimbabwe presents a unique case for two reasons; firstly, when dollarisation was legislated it was not backed by foreign reserves as the central bank had none, thus whatever ZWD balances were present were set to zero. Secondly, the ZWD was completely removed from circulation as opposed to more typical situations where a dual currency economy is created. The main challenges faced by Zimbabwe are not unique in the dollarisation discourse. Post multicurrency implementation, economic volatility has declined, however, dollarisation has limited the effectiveness of monetary policy, due to the fact that the central bank cannot print its own currency (Ize and Yeyati, 2005). Another impact is lost seigniorage due to not issuing local currency, with little ability to recoup lost revenue from issuer of foreign currency in most instances; limited economic links exist between the popular US dollar and Zimbabwe (Chang, 2000). Dollarisation also reduces the efficiency of payments, specifically in Zimbabwe, banknotes circulate at high rates resulting in questionable note quality and acceptance (Konkeyne et al., 2010). Dollarisation increases the likelihood of a liquidity crisis, with the central bank unable to provide funding in the event of a bank run, this leaves foreign currency holders more prone to panic, a very visible characteristic in Zimbabwe (Chavez, 2012).

A review of the international experience of dedollarisation suggests that dollarisation is not easily reversed, even after underlying causes have been removed. They highlight that successful attempts to dedollarise have been market-based and combine a track record of macroeconomic stability with other policies to enhance the attractiveness of the local currency (Garcia-Escribano, 2010). Most of the literature on dollarisation makes reference to dual currency environments, we attempt to adapt this in order to explain the Zimbabwe multicurrency environment.³

4.1. Currency Substitution, Asset Substitution, and Financial Dollarisation

It is important to understand that Zimbabwe went through three transitions leading to implementation of dollarisation policy. As the economy disintegrated and the value of the

³ Dual currency means local currency and foreign currency concurrently used in the economy at the same time. Multicurrency means the use of more than one currency

ZWD declined, *currency substitution* came into effect with more economic trades being conducted in foreign denominated currencies. Immediately following was *asset substitution* where foreign denominated currency was used as a store of value, and finally a policy of *financial dollarisation* was implemented in 2009. In terms of the dynamics of money demand, as inflation rises dollarisation within an economy also increases, this is further accelerated by a lack of financial depth (Yeyati, 2005). Inflation is extremely relevant in this instance as it ties in exchange rates. For Zimbabwe, hyperinflation meant the exchange rates were a moving target with heightened speculativity. Any scheme to control the rate of inflation at a short horizon must control, to some extent, the nominal exchange rate (Chang and Velasco, 2000). The policy of dollarisation be it defacto or through policy, limited and killed both inflation and exchange rate volatility respectively.

Business and governments that hold local denominated debt in a rising inflation environment look to limit the costs of inflation and exchange by doing more of their business in foreign denominated currency or devaluing the local currency. In the case of governments, more debt related contractual arrangements are primarily structured taking interest rates into consideration as a risk measure, meaning that the depreciation of the currency is offset by changes in interest rates, more pertinent to the receiver of interest payments.(Yeyati, 2003). Eventually governments are forced to dollarise, in order to meet obligations but also to better manage tax revenues.

4.2. De- Dollarisation Mechanism

One of the most significant challenges of de-dollarising an economy arises from long lasting memories of inflation in economies with a track record of monetary mismanagement (Savastano, 1996). Credibility must be re-established and measures to create an environment of de-dollarisation can be taken in parallel with stabilisation policies, with both taking account of risks, capital flights, disintermediation, banking sector instability, exchange rate variability, public debt management and prudential monetary policy (Chavez, 2010). The mechanism suggested in this paper implies that the culture of the Zimbabwe's economy relies on perceptions of tangibility. Arguably, using

gold as the reserve creates a tangibility perception which will go a long way to restoring confidence in agents that use the local currency against which it is issued. It would be easy to convert gold into dollar reserves, but the view is that this is more fluid and less tangible and more susceptible to manipulation. The World Gold Council (2010) suggests that gold reserves can be used as a tactical overlay to hedge against current global macroeconomic risks; and as a high-quality liquid asset in periods of distress, the time when central banks most need their reserves. It is for these reasons that we select gold as our reserve, also because it is in relatively high supply in Zimbabwe with a number of established producers.

The market-based mechanism of de-dollarization also relies on dis-incentivising usage of the US dollar. When exchange rates can move towards depreciation and appreciation, it introduces a disincentive to dollarization in the presence of controlled inflation, even more when targeting inflation is in place (Chang, 2010). Bear in mind that this can operate in reverse if agents begin to form expectations based on trend, thus to offset this, the demand environment should be based on greater liquidity in the local currency than in the foreign currency. The issuing of bills and bonds in the domestic currency can put in place a benchmark for interest rates; further the development of a foreign exchange market and an adequate level of official reserves diminish the need to hold foreign currency (Chang, 2010). Further low and stable inflation is not enough to reverse dollarization; credible inflation targeting seems to be important for achieving de-dollarization. In light of this we must expect that some assets will still remain denominated in foreign currency. In the case of Uruguay, there was a negative correlation between national income and real exchange rate, meaning that the yield of dollar denominated assets rise when national income falls. This would likely mean that in the case of Zimbabwe some level of dollarized deposits will always remain (Licandro and Masoller 2000).

4.3. Protecting the Value of Gold Reserves

Market based price risk management refers to any strategy that uses financial products to help producers reduce the uncertainty surrounding the prices they can get for their product (UNDP, 2011). In terms of market based solutions, for Zimbabwe we have the ability to create a reserve based on a legislated free carry on gold which amounts to a 7% royalty of all production. However the value of gold is determined in public markets and thus to ensure economic stability, the value of these gold reserves must be managed through public markets. While this adds another level of risk, it ensures that policy formation is conducted in a stable, manageable, and predictable environment. This paper endorses the use of barrier or collared option linked in part or in full to the gold reserve. Gold producing companies often hedge future production through derivative instruments especially in times when the gold price is highly volatile. It must be said, however that the long term trend of gold is positive. The method used tries to defend the value of the new ZWD. Essentially it's a call and put option in one instrument, where if the price of gold falls the value of the reserve is protected through the 'put' leg and if the price rises, knock out level are established which ensure that the incremental value does not over appreciate the value of the local currency, essentially triggering another barrier option to come into place or the sale of gold within the public market.

There are three basic reasons to use barrier options rather than standard options;

- Barrier option payoffs may more closely match beliefs about the future behaviour of the market.
- Barrier options may match hedging needs more closely than similar standard options.
- Barrier option premium are generally lower than those of standard options.

(Derman and Kani, 1996)

The mathematics of the barrier option is beyond the scope of this paper; however principally the use of the barrier option is designed to provide stability in monetary policy formation, it enables the reincarnation of the trust factor, it supports the idea of protecting value, and lastly prevents irregular behaviour by the central bank due to regulated exposure to public markets.

4.4. De-dollarization, Inflation and Money Supply

By issuing a new currency into an environment where a foreign denominated currency is already in circulation presents a serious inflation risk, especially if the productive capacity is not present to soak up the new dollars on issue. Zimbabwe presently has capacity utilisation of 50%. Many businesses of all scales fail to get the necessary funding due to liquidity constraints, driven in part by potential moral hazards prevalent in an unproductive economy. Two considerations need to be made; firstly, the new ZWD is asset backed, thus its value is dependent on an underlying instrument, with its exchange rate being fixed. Secondly, there is a gap recognised through the underfunded manufacturing sector indicative of low capacity utilisation.

Arguably an increase in money supply should look to fill that gap due to high money demand, resulting in limited inflationary pressure in the short to medium term (Pettinger, 2010). As the productive sector recovers, greater competition ensues and this should further add downward pressure on inflation. However, as noted earlier, the relationship between dollarization and inflation is not clear. Historic examples of countries that have seen prolonged periods of low inflation remain dollarized to a high degree (Reinhart et al., 2003). That being said, the environment often described is dualised whereas Zimbabwe is not, adding to the uniqueness of the situation, and allowing for the reinforcement of the production funding gap that presently exists. Further by creating a currency substitution environment one can expect greater exchange rate volatility (Alvarez-Plata and Herrero, 2007). There is a strong positive correlation between currency substitution and exchange rate volatility (Calvo and Varlos, 1992). This also makes the exchange rate more susceptible to perceptions of increased money supply, which on the one hand supports the idea of a managed rate through a gold peg which may control potential volatility. On the other hand, could also create arbitrage opportunity which could offset necessary gains. In another example, Russia in 2003, experienced rapid money growth, while inflation remained low; this missing inflation could be explained by de-dollarization. Empirically it has been found that excess supply of broad money is inflationary, and has the strongest most significant impact on short-run inflation (Ohnsorge and Oomes, 2005).

4.5. Multiplier Effect on New Money

Aside from improving liquidity conditions and supplying another from capital, reintroducing the ZWD is meant to trigger the deposit multiplier allowing for local currency assets to be longer dated thus giving incentive for long term borrowing. The bank lending leads to new deposits in the banking system and a multiplier effect on the money supply (Manish, 2011). The size of the money multiplier is reduced when funds are held as cash and not as deposits. The RBZ has to date increased the reserve ratio requirement by banks from U\$25,000,000 to U\$100,000,000 in order to raise the effect of the deposit multiplier, but in a dollarized environment where rate discovery is difficult this is unlikely to improve conditions. A shift has occurred where time deposits have become more popular due to better savings rates offered; the deposit base continues to be dominated by transitory deposits, which cannot support industry as it requires long term financing to recapitalise operations (RBZ, 2012). Subsequently the short term nature of lending, high liquidity risk and limited access to external lines of credit has deprived the economy of capital intensive projects which are imperative for sustainable economic growth (RBZ, 2012).

Complementing the introduction of the ZWD would be reactivation of the money market which is the primary environment (ex-repurchase rate) for interest discovery and has implications further down the yield curve. Within the de-dollarizing framework it may be an option to also bailout local banks through injections of capital. Local banks, as is normally the case, would be forced to borrow from the RBZ at a set repo-rate and on-lend to the market creating a spread, which would all be done in ZWD. This would in essence trigger the deposit multiplier effect.

4.6. Gold Standard

The price of gold had been the single most reliable monetary reference point in human history (David Gitlitz 1995). Judy Shelton in her recent book on “Restoring Order to the

Global Currency System” argued very strongly for the “re-imposition of an International Gold Standard” She thinks that a return to gold backed currencies would force governments, to display more fiscal responsibility or face the prospects of investors demanding gold for their paper currency”. In the long run the gold commitment by government, assures people that the financial assets they are holding can be transferred intact between generations (Ninhouse, 2011). In the Zimbabwean context, discipline is indeed required, but the selection of gold is more the basis of the uniqueness on the Zimbabwean condition; which are perceptions of value that reinstate institutional trust, and large local reserves of gold which are accessed by a relatively well developed private sector. By implication the costs of collecting the royalty are low and borne upon the miner rather than the state.

Another angle of observation is to state that the gold reserve is not intended to be a long term solution but rather one which sees human productivity improve to a point where the economy is healthy enough to respond and react to external stimuli relatively independently. The gold standard works in so far as gains in human productivity move at roughly the same pace as gains in the production of gold, when human productivity outpaces gold an absolute gold standard will create massive deflation (Bowyer, 2007). This is to say that gold through time has been a predictor of inflation, however in present economic times of booms and busts the human condition is fallible; when Nixon removed the gold standard the global economy experienced a period of massive deflation. For Zimbabwe presently the production of gold far outpaces GDP growth, and if we subscribe to Bowyer’s ideology then there is room for the implementation of an asset – backed refloats of the ZWD using gold as the base. Under this same premise, however a future plan will be required, which will likely be a free-floating of the domestic currency subject to political and macroeconomic stability and contingent on growth reaching a desirable level.

4.7. Financial Deepening of Local Currency Assets

A two pronged policy approach is needed; development of markets in the domestic currency to generate a credible alternative to the dollar and strengthening of the safety net through the regulatory recognition of non-marketable risks (Licandro and Licandro, 2003). It is important to develop financial markets through regulation which will foster an environment where the new ZWD can act according to intended market requirements. It would be impossible to reintroduce the ZWD if certain changes are not enforced which improve financial sector performance and efficiency. In terms of liquidity a differential should be created between US Dollar and Zimbabwe dollar deposit. On the solvency, capital requirements and provisions should be higher for dollar denominated credit to non-tradable sectors than in the credit with no currency mismatch. Also, a deposit insurance scheme should be created which takes into account the risk of currency mismatches into premiums charged to banks (Licandro and Licandro, 2003). Moreover the deepening of domestic financial markets in local currency assets must see the evolution of longer maturity assets (Galindo and Leiderman, 2005). Undeniably Zimbabwe requires a more secure financial system, one able to respond to shocks, and where risk can be better priced due to improved flow of information and transparency. The concerns around property rights are also well warranted and without some kind of indication or event that shows that these rights are respected the financial sector will continue to see challenges.

4.8. Why the Zimbabwe Dollar

Earlier in the paper we indicated the currency options the government is considering, which include; adopting the US dollar in full, waiting for a regional currency, joining the South African Currency Union which in essence means fully adopting the Rand, and lastly re-introducing the ZWD. The paper has already explained the weaknesses currently prevalent in using the US dollar. Arguably the economy will remain stagnant if it has to wait for a regional currency which is yet to be formulated. In addition, lack of integration between regional economies may render the effectiveness of a common Sub-Saharan monetary unit ineffective and actually could establish an environment of defacto

dollarisation. Empirically joining the South Africa Currency Union presents a prudent solution to improving the financial environment. After running a simple least squares regression on the Zimbabwean CPI and the South African price index using 37 data points between 2009 and 2012 we find a positive and significant relationship, where 98% of the variation in Zimbabwean CPI can be explained by changes in the South African CPI (Appendix 1). A logical conclusion for this relationship is that Zimbabwe is heavily reliant on South Africa for its imports, thus changes in prices of goods and services, be they finished or raw materials, will have an impact on prices within the Zimbabwean economy. Interestingly a similar study using US consumer prices shows no such similarities, implying that the economic links between Zimbabwe and the US are limited. Notwithstanding this, arguments provide that volatility of the rand, political uncertainty in South Africa, and some level of national sovereignty are deterrents to adopting the rand. The US dollar on the other hand is the currency in which most of Zimbabwe's export commodities are denominated, further the currency is more trusted as a store of value due to its perceived stability but as we have shown it has its challenges (Noko, 2011).

5. RESEARCH METHODOLOGY

This paper makes use of robust research methodology that takes a quantitative approach. Our research includes the design of a theoretical model which is supported by strong and in-depth data sets and analysis. These various different data sets are used to analyse the present state of the Zimbabwe's financial economy between periods pre and post dollarization. This allows us to identify to whom Zimbabwe's economy has the strongest linkages. By understanding these linkages we can see effectiveness of dollarization on the Zimbabwean economy in relation to the price environment. Money supply and liquidity are also important variables along with the respective demand and supply of money (capital) by financial institutions, as this is what will determine the growth or lack thereof in manufacturing production. In essence we should see that due to a low liquidity (turnover of money) production cannot grow and economic improvements cannot occur. Each data set will be described and results explained. Ultimately each test should reflect the strengths and weaknesses of dollarization, and extrapolation of these data points should lead to suggestion of an alternative. Our methodology will show that one can smooth out the volatility in Money Supply, which should improve predictive assessments in the economy.

6. RESEARCH FINDINGS, ANALYSIS AND DISCUSSION

6.1.1. Financial Dollarization and Economic Volatility

Past research suggests that dollarization post a hyperinflationary period reduces economic and price volatility while restoring confidence and predictability. In this analysis we look at the rolling changes in Standard Deviation of Zimbabwe's GDP from 1980 to 2012 and CPI changes between 2009 and 2012. We already know inflation prior this period was at astronomical levels. The period of dollarization is between 2009 and 2012 volatility reaches its lowest record level since independence for GDP; low values are seen for CPI as well.

Data set: Zimbabwe GDP 1980 -2012
 Changes in Zimbabwe CPI pre and post dollarization
 36 Data points

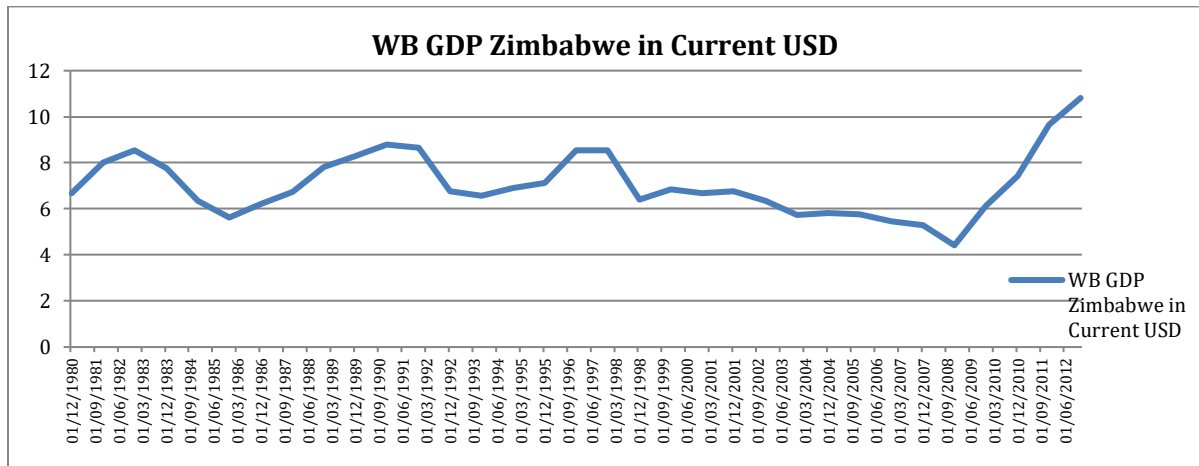


Figure 13 Data Source World Bank Zimbabwe GDP in Current USD, World Bank

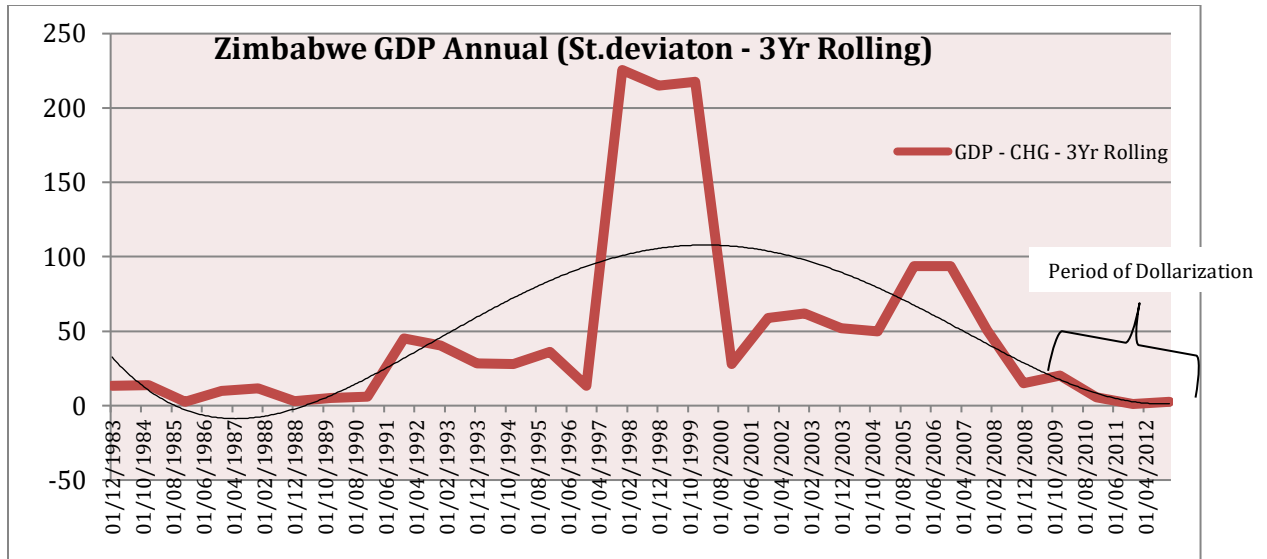


Figure 14 Data Source World Bank Zimbabwe GDP in Current USD, World Bank

As indicated above, during the period of dollarization, volatility is seen to have decreased. Taking this further we test the relationship between increases in USD deposits (M3) against GDP changes to see if USD environment explains the falls in economic volatility – due the limited number of data points our results do not provide any conclusive indication of a relationship. While our R-Square is strong at 0.605, the levels of significance do not support our assumption that increases in USD deposits should have an effect on economic volatility.

SUMMARY OUTPUT

Regression Statistics

Multiple R	0.778305
R Square	0.605758
Adjusted R Square	0.408637
Standard Error	1.627172
Observations	4

ANOVA

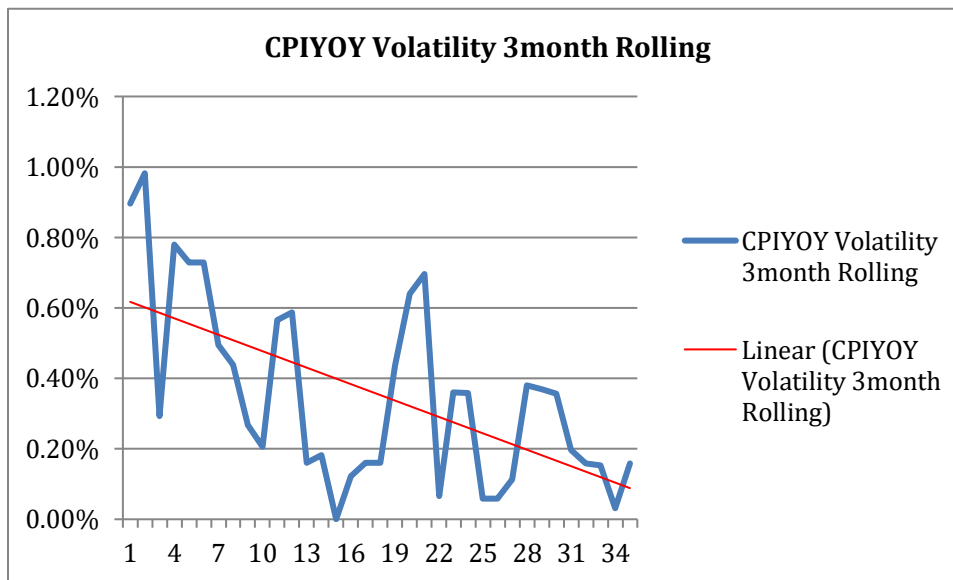
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	8.136412	8.136412	3.073026	0.221695
Residual	2	5.295374	2.647687		

Total 3 13.43179

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	7.453456	1.01217	7.363841	0.017946	3.098442	11.80847
M3 Money Supply	0.163733	0.093401	1.753005	0.221695	-0.23814	0.565605

(Please note: Zimbabwe instituted a multicurrency regime, involving the use of other currencies not just dollars, it is just dollars that are better represented in the deposits of financial institutions are recorded by the Reserve Bank)

A closer look at CPI changes in the dollarized environment indicates that volatility over 4 years analyzed quarterly has decreased.



Source Data. Source. RBZ, Interims Monetary Policy Statement Updates 2009 – 2011,2012

To conclude – observational analysis of standard deviation indicates that during periods of dollarization economic and price volatility is low.

6.1.2. Zimbabwe Consumer Price Inflation and currency, regional and international relationship

We analyze this information to reflect that Zimbabwe has limited economic ties with the United States and greater ties with South Africa and Europe in a dollarized context (2009 -2012). Changes in the rand/dollar exchange rate go a long way in explaining price movements in Zimbabwe (as measured by CPI) at least this is what we would expect, however when we look at the currency effect combined the results are interesting. The

CPI measures used are that of China, United Kingdom, USA, South Africa, and the Euro Area.

Data Set: Zimbabwe CPI (dependent variable) with SA, UK, USA, China annual CPI as independent variables.
 Zimbabwe CPI (dependent Variable) with Rand, Pound, Yuan as independent variables.
 Data Observations 45 (2010-2013)

SUMMARY OUTPUT

<i>Regression Statistics</i>	
Multiple R	0.6212862
R Square	0.3859966
Adjusted R Square	0.3260938
Standard Error	1.4772234
Observations	46

ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	4	56.2456382	14.06141	6.4437179	0.000405062
Residual	41	89.46974441	2.1821889		
Total	45	145.7153826			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	1.7075351	2.158831217	0.7909535	0.4335229	-2.652312992	6.0673831	-2.652313	6.0673831
SA CPI YoY	-0.1292436	0.583868287	-0.2213575	0.8259129	-1.308389539	1.0499023	-1.3083895	1.0499023
USD CPI YoY	-1.0846154	1.242232136	-0.8731181	0.3876839	-3.593354039	1.4241233	-3.593354	1.4241233
Euro CPI YoY	2.1465139	0.644161729	3.3322593	0.001833	0.845602943	3.4474249	0.8456029	3.4474249
China CPI YoY	-0.2074004	0.207828345	-0.9979408	0.3241616	-0.627118235	0.2123175	-0.6271182	0.2123175

While the regression is valid the results show that there is a positive and significant relationship between Euro-Area CPI and Zimbabwe CPI YoY. Thirty eight percent of the changes in Zimbabwe CPI are explained by the independent variables. With South Africa being Zimbabwe’s largest trading partner we would have expected a stronger relationship however this may not be reflected in our test due to the timing of the observations.

We already know South Africa is Zimbabwe’s largest trading partner, therefore we re-run the regression lagging the SA CPI by 1 month and the result affirms our assumption that prices changes in Zimbabwe are significantly explained by price changes in South Africa, as indicated in the tables below.

SACPI vs. ZIMCPI YoY lagged 1

Period

<i>Regression Statistics</i>	
Multiple R	0.983064
R Square	0.966416
Adjusted R Square	0.965483
Standard Error	0.623513
Observations	38

ANOVA					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	402.7351	402.7351	1035.927	3.97E-28
Residual	36	13.99565	0.388768		
Total	37	416.7307			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	19.60399	2.364752	8.290083	7.23E-10	14.80805	24.39993	14.80805	24.39993
SACPI YOY	0.669894	0.020813	32.18581	3.97E-28	0.627683	0.712106	0.627683	0.712106

The effect of currencies relationships is important and we look to explain the effect of currency on Zimbabwe CPI.⁴

It is important to also look at currency relationship to consumer inflation as means of deepened the analysis of the regional and international economic relationships during dollarization.

Regional and International Currency against Zimbabwe CPI YoY

GDP,CNY,EUR,ZAR vs. ZIMCPI
YoY

<i>Regression Statistics</i>	
Multiple R	0.6900393
R Square	0.4761542
Adjusted R Square	0.4250473
Standard Error	1.3644653
Observations	46

ANOVA					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	4	69.38299859	17.34575	9.316829	1.89E-05
Residual	41	76.33238402	1.861765		

⁴ Please, note the European Union is the Zimbabwe's second largest trading partner after South Africa which could partly explain this relationship

Total 45 145.7153826

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	63.791699	22.9105353	2.784383	0.008078	17.52293	110.0605	17.5229346	110.0605
Pound	6.8663734	7.328688197	0.936917	0.354288	-7.93421	21.66696	-7.9342125	21.66696
Yuan	-4.361638	1.854442734	-2.35199	0.023557	-8.10676	-0.61651	-8.1067606	-0.61651
Euro	-22.80003	4.689056481	-4.86239	1.74E-05	-32.2698	-13.3303	-32.269768	-13.3303
Rand	-1.634317	0.392915607	-4.15946	0.000159	-2.42783	-0.84081	-2.4278262	-0.84081

When testing for currency the results are as expected. A greater amount of Zimbabwe’s CPI is explained the Yuan, Euro, and Rand with significance as opposed to the previous test which used CPI YoY data. Interestingly, the Euro has the largest coefficient, versus China, and lastly the Rand. This is an unexpected result. We run the regression again with just the rand and again we lag for 1month we see the results improve dramatically.

ZAR vs. ZIMCPI Yoy, Lagged 1 Period

Regression Statistics

Multiple R	0.523295
R Square	0.273837
Adjusted R Square	0.25309
Standard Error	0.04056
Observations	37

ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	0.021713	0.021713	13.19855	0.000889
Residual	35	0.057578	0.001645		
Total	36	0.079291			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	-0.01807	0.007663	-2.35802	0.02409	-0.03363	-0.00251	-0.03363	-0.00251
X Variable 1	4.942856	1.360551	3.632981	0.000889	2.180791	7.704921	2.180791	7.704921

To conclude, CPI and regional and international currency can be used to explain the relatively decent amounts of movement in Zimbabwe’s consumer prices in a dollarized environment. The South African rand and prices in a dollarized setting have strong relationships with Zimbabwean prices; one would therefore expect that if there were an economic shock in South Africa it would certainly be felt in Zimbabwe. As some of the literature reviewed has explained, dollarization may sometimes have the effect of leaving an economy exposed to economic shocks (Cabral-Torres, 2005). With strong linkages to

South Africa, possibly adopting the South Africa Currency Union (SACU) could likely have a positive impact on the state of the Zimbabwean economy. We take closer look at money supply.

6.1.3. Money Supply (M3), Supply of Credit and Growth

Our previous tests confirmed that dollarization reduces economic and price volatility. We have also shown the Zimbabwe’s prices can be explained to a large extent by movement in the South African prices, as well as changes in the South African Rand. We now look at the relationship between money supply, the provision of credit to the private sector, the depth of lending in financial institutions, and GDP growth. We have argued that the extension credit should contribute towards economic growth. We further suggest that in illiquid markets or tight markets credit risk is high and usually there is a mismatch in lending and deposit rates which creates inefficiencies that may stifle growth. We would expect that as Money Supply (M3) grows, loans and credit should grow, and this should have a positive and significant relationship to GDP. Failure to witness this result in any of these variables would likely suggest that credit markets are tight, and hence the above mismatch exists. Therefore we ran a test during the period of dollarization (2009 – 2012) to see the relationship between GDP, M3, LDR, & PSC using the equation below;

$$GDP = \beta_0 + M3_{x^1} + LDR_{x^2} + PSC_{x^3}$$

$$GDP = \beta_0 + M3_{x^1} + LDR_{x^2} + PSC_{x^3}$$

<i>Regression Statistics</i>	
Multiple R	0.922970916
R Square	0.851875313
Adjusted R Square	0.838805487
Standard Error	0.715481556
Observations	38

<i>ANOVA</i>					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	3	100.0977668	33.36592225	65.17878	3.50763E-14
Residual	34	17.40507114	0.511913857		
Total	37	117.5028379			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>	<i>Lower 95.0%</i>	<i>Upper 95.0%</i>
Intercept	2.950883349	0.604352867	4.882715892	2.44E-05	1.72269056	4.179076	1.722691	4.179076

M3	1.77831E-09	4.13427E-10	4.301392724	0.000135	9.38126E-10	2.62E-09	9.38E-10	2.62E-09
LDR	0.629251912	1.974018471	0.318766983	0.751853	-3.382436265	4.64094	-3.38244	4.64094
PSC	-0.84514118	1.357025076	-0.622789656	0.537578	-3.602947923	1.912666	-3.60295	1.912666

While the test is valid, only Money Supply (M3) has a positive and significant effect on GDP growth over the period. Loans to Deposits and Private Sector credit produce insignificant coefficients. This would support the view of weak or tight credit markets, possibly suggesting that the levelling off of GDP growth in Zimbabwe is mainly due to inefficiencies in credit markets. These inefficiencies may result from a mismatch of rates, lack of financial deepening, a non-existent multiplier effect, and a very short yield curve to determine a market efficient level of interest rates.

In conclusion, the growth that has been seen in GDP since the introduction of dollarization as a policy measure was a function of a recovery from a low economic base; it would take an effective credit market to drive further economic improvement (inter alia). Credit risk would be addressed through restructured financial regulatory institutions and the establishment of range of financial instruments that allow the derivation of a prime interest rate. Banks do not have money to lend without fear of losing liquidity and money is too difficult to obtain to repay loans, which is putting off prospective borrowers (Pytel, 2010). Thus according to our tests, not only does money supply have to improve, the more crucial and necessary solution is an effective financial system. Add to that, while volatility, predictability, and some level of economic confidence have been restored under the dollarized regime, the policy measure may not have a strong enough relationship to growth to actually drive it.

6.1.4. Money Supply (M3), and Inflation

Volatility of Money Supply

Common reference is made to the relationship between money supply and inflation. Firstly we analyse changes in M3 YoY in Zimbabwe since 2010 charted against South Africa and Euro-Area M3. The chart suggests the changes in ZIMM3YOY are far more volatile than in the other regions, namely South Africa and Euro Area.

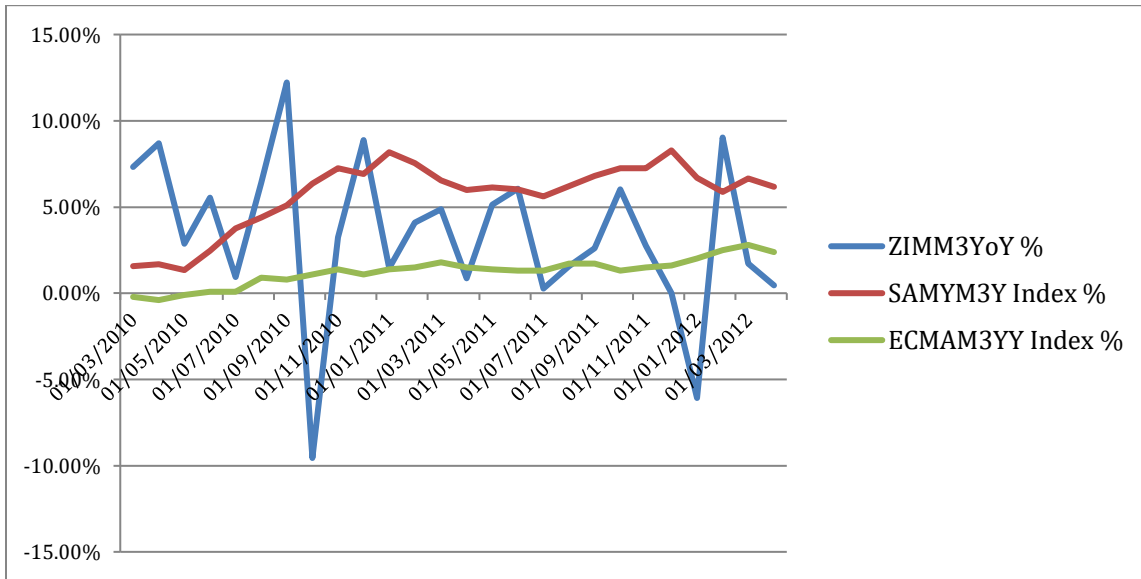


Figure 15 Source. Bloomberg Data – Changes in M3 YoY

We do this observational analysis to merely reflect how large the swings are in Zimbabwe money supply.

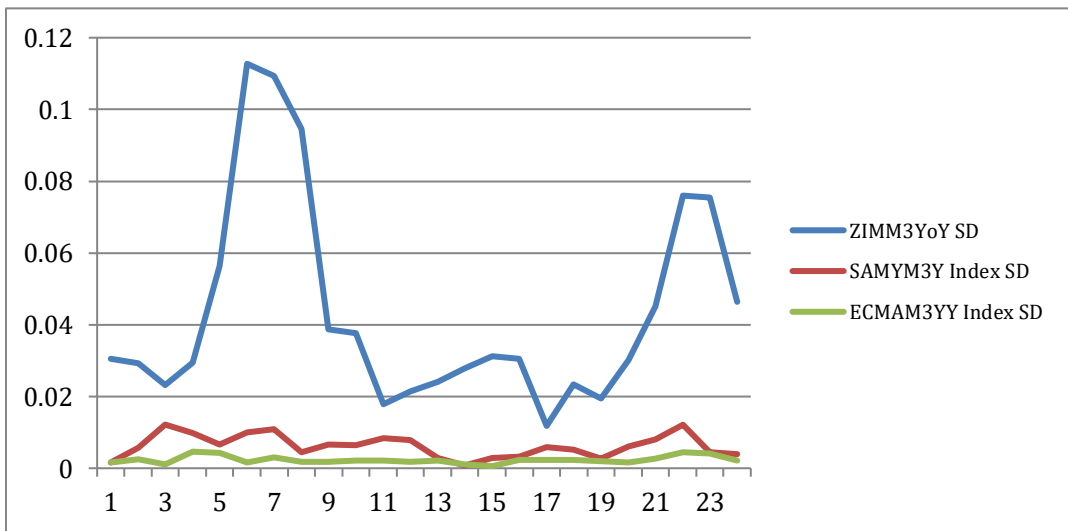


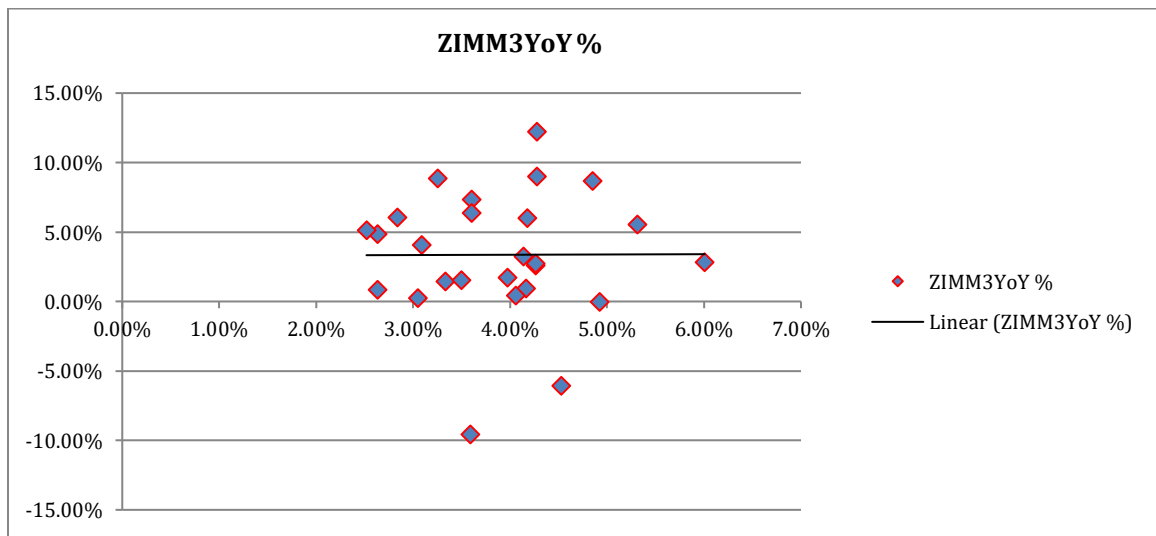
Figure 16 Source. Bloomberg Data – Rolling 3Month Volatility

We illustrated earlier that ‘deposit days’ are very short, therefore implementing effective monetary policy would require more stable M3, or a policy measure that could otherwise smooth out the volatility in M3 Money supply.

In conclusion, again this volatility supports our argument that lack and rate discovery, and weaknesses of financial economic confidence inter alia may have a limiting effect on the economy. The above chart will be used again later in the paper as it will be the basis for our argument for bringing back the Zimbabwe Dollar using a gold float. The theoretical model will show that in a dualised currency environment (ZWD plus USD) the addition on new dollars should smooth out ZIMM3YOY volatility and allow for better policy creation which will be effective in resuscitating Zimbabwe’s financial economy.

Money Supply and Inflation

ZIMM3YOY % explained very little of the movement in ZIMCPIYOY %, which is the opposite result of what we would reasonably expect. A regression examining the changes in inflation versus money supply produces insignificant results. We will test later if an injection of new money to existing money in circulation will produce a significant result on inflation this will be done in our theoretical model of reintroducing the Zimbabwe dollar.



In conclusion, according to the test conducted, in Zimbabwe the money supply and inflation show little relationship. In more developed economies central bank policy

targets inflation in an effort to manage growth outcomes of a country. To do this it is important to understand the circulation of currency in an economy using M3 – inflation is technically due to increases in money supply. Monetary policy should in effect be used to smooth out the heightened effects of the business cycle (Roubini, 2011). We could conclude from our analysis that in Zimbabwe this is not occurring.

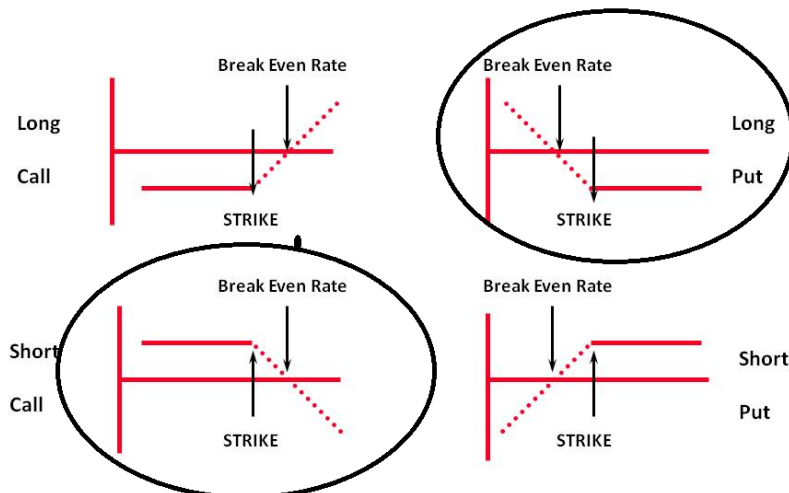
6.1.5. Barrier Options – Straddles or Combinations and how they protect value and create income – on a commodity

Options Explained in Context

The process of backing the ZWD with gold looks to protect the value of the gold reserves and therefore the value of the currency by writing (selling) and purchasing derivative strategies designed to cover any unexpected volatility beyond a particular level. We use 8% in this model as an acceptable risk daily limit. Options are used which give the holder the right but not the obligation to buy or sell the underlying commodity at particular level in the future. Ideally, one would write an option of a future traded on a commodity exchange.

Option Pay off Profile

AT Expiry Payoff for Long/Short Call-Put



Source – aarupbanerjee.wordpress.com

The profiles we are particularly focussed on are the long put and short call. The long put entails paying a premium which means an outflow from our base. While the short call means we earn an income as we receive income from the purchaser. As the value of our base needs to remain within our set limits in the face of a fluctuating gold price, the following must occur. If the gold price rises above our upper limit (+8%) put options are bought. The outlay will bring the implied value our underlying back into a range set by the central bank, and protects the gold asset from any downside. If the price of gold falls, call options are sold which means the central bank receives income that brings the implied value of the asset back into the pre-established range. This means that the value of our physical position in gold, and therefore the currency, remains within set and acceptable risk levels as determined by the central bank, in this model it is an 8% range.

Mechanism

We describe and test the workings of the barrier option and the pay-off profile in the event of gold price volatility beyond the strike price on both the up and down legs. The strategy is designed around calculations of rolling 3 month Standard Deviation. These are the acceptable risk limits beyond which active action is taken to protect the value of the underlying asset. The strategy is traded in the open market for gold derivatives and structured in a way that prevents arbitrage on the ZWD, as the underlying value is kept approximately but not exactly the same.

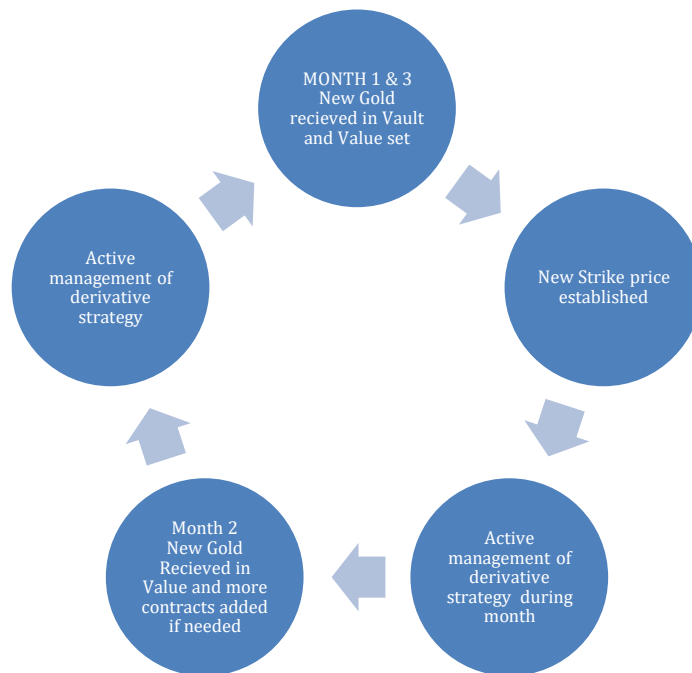
It is important to take some aspects of the profile into account:

- a. Central Bank manages the derivative strategy.
- b. For the purpose of this example, the risk limit is set at 8% on the up and downside of the basket. Therefore, if the gold price (of gold in the vault) is \$1039, the upper limit is \$1122 and the lower limit is \$957.
- c. The purchasing of options implies an outlay of cash which is paid to the contract writer . This would be subtracted from the value of the gold base (as cash in USD).

- d. The writing of options implies that receipt of income from the purchaser of the option (in cash USD).
- e. If the gold price breaks through the 8% on the upside, put options are purchased (outflow). Call options are written (sold) in the event that the gold price moves below 8% i.e below \$957.
- f. The strike price is set as the aggregate average price of all gold received and in vault eg;

Month	Gold in Vault (Kgs)	Gold Price at Receipt (USD)	Total Value (Px and Quantity)
March	8.595	919.35	278729
April	10.845	888.2	339778
May	12.105	979.18	418102
Total	31.545	931.60 (Strike Px)	1036611

g.



Back-testing of Option Strategy

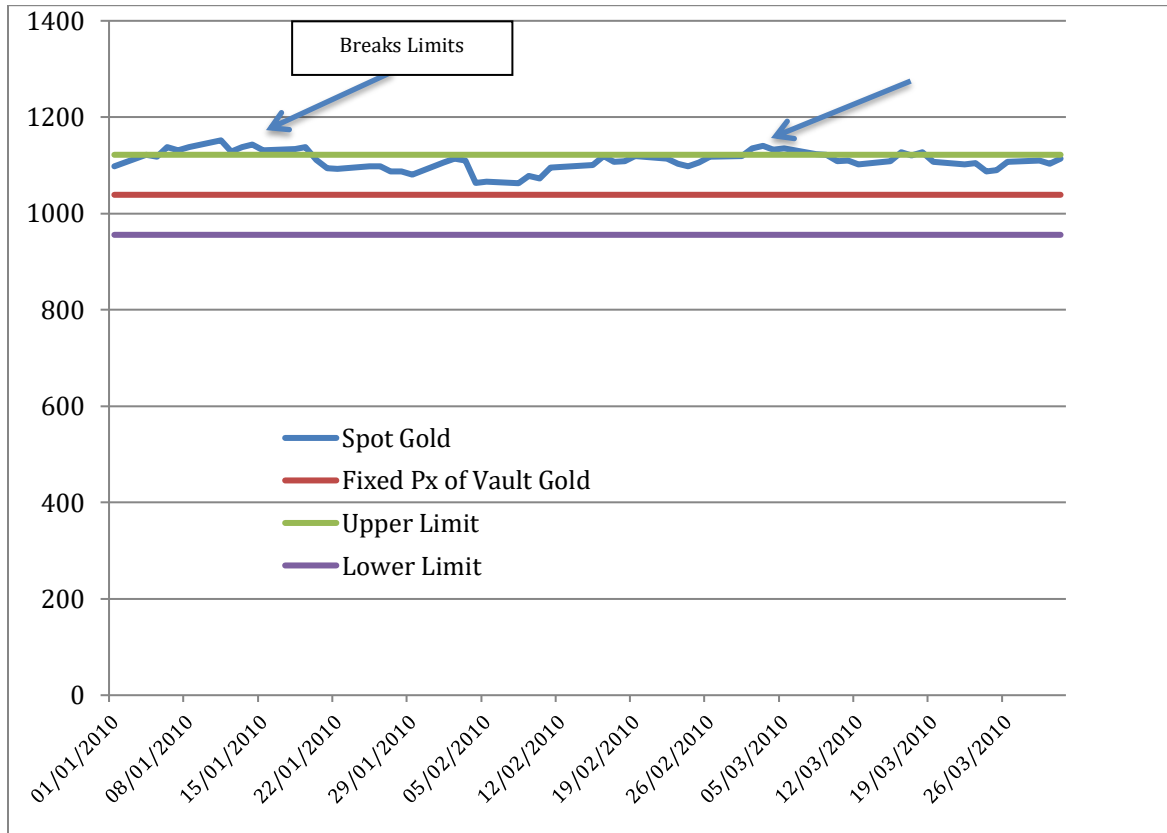


Figure 17 Source Bloomberg Data – Refer to Appendix for full data set

Using the 8% band, the strategy is back tested in the graph above. Effectively if the gold price breaks the 8% band on the upside – the difference between the underlying value of the gold stock and the implied (market value) is accounted for by the purchase of an equivalent amount of put options. This is illustrated in the table below (full table Appendix A). In the period calculated there, are no down days on the gold price, therefore no call options are written to earn an income that would offset whatever losses are occurring on the underlying asset.

Date	PX_LAST	Average Px of Gold in Vault	Upper Limit	Lower Limit	Ounces in Vault	Value of Gold in Vault	Implied Value (Mkt Value)	Surplus or Deficit	%Chag from Gold Px	No of Contracts	Contract Exposure ('00000)	Effect on Implied Value	Strategy
1/1/2010	1097.35	1039	1122	956	10949	\$ 11,374,472	\$ 12,014,885.15	\$ 640,412.98	5%	-	-	-	0
1/4/2010	1121.28	1039	1122	956	10949	\$ 11,374,472.17	\$ 12,276,894.72	\$ 902,422.55	7%	-	-	-	0
1/5/2010	1118.05	1039	1122	956	10949	\$ 11,374,472.17	\$ 12,241,529.45	\$ 867,057.28	7%	-	-	-	0
1/6/2010	1138.25	1039	1122	956	10949	\$ 11,374,472.17	\$ 12,462,699.25	\$ 1,088,227.08	9%	11	1,088,227	11,374,472.17	Long Put
1/7/2010	1131.75	1039	1122	956	10949	\$ 11,374,472.17	\$ 12,391,530.75	\$ 1,017,058.58	8%	10	1,017,059	11,374,472.17	Long Put
1/8/2010	1138.23	1039	1122	956	10949	\$ 11,374,472.17	\$ 12,462,480.27	\$ 1,088,008.10	9%	11	1,088,008	11,374,472.17	Long Put
1/11/2010	1151.85	1039	1122	956	10949	\$ 11,374,472.17	\$ 12,611,605.65	\$ 1,237,133.48	10%	12	1,237,133	11,374,472.17	Long Put
1/12/2010	1128.48	1039	1122	956	10949	\$ 11,374,472.17	\$ 12,355,727.52	\$ 981,256.35	8%	-	-	-	0
1/13/2010	1138.18	1039	1122	956	10949	\$ 11,374,472.17	\$ 12,461,932.82	\$ 1,087,460.65	9%	11	1,087,461	11,374,472.17	Long Put
1/14/2010	1142.75	1039	1122	956	10949	\$ 11,374,472.17	\$ 12,511,969.75	\$ 1,137,497.58	9%	11	1,137,498	11,374,472.17	Long Put
1/15/2010	1130.93	1039	1122	956	10949	\$ 11,374,472.17	\$ 12,382,552.57	\$ 1,008,080.40	8%	10	1,008,080	11,374,472.17	Long Put
1/18/2010	1134.1	1039	1122	956	10949	\$ 11,374,472.17	\$ 12,417,260.90	\$ 1,042,788.73	8%	10	1,042,789	11,374,472.17	Long Put
1/19/2010	1138.35	1039	1122	956	10949	\$ 11,374,472.17	\$ 12,463,794.15	\$ 1,089,321.98	9%	11	1,089,322	11,374,472.17	Long Put

Table 2 Source Bloomberg Data – With Calculations for option contracts

The options on the long put leg would provide better pay-off if they expire and the gold price is back within the range. If the put expires and is in the money, the value of the underlying would rise, effectively increasing the value of the gold stock and therefore strength in the currency.

The short call option (written option) would provide a bearish strategy that provides income, and again expiry when gold price is within the range would be an ideal outcome. Because we already sit on physical gold which can be delivered if the option is exercised by the holder – another strategy would be needed that knocks the option out in the event of adverse moves. A short call is one of the riskiest option strategies in the event that the price of the underlying continues to rise.



Figure 18 Source Bloomberg Data – Refer to Appendix for full data set

These contract maybe over gold futures – therefore the character of their structure is standardised. 1 Contract entitles the holder to 100troy oz; each point value move is \$100 – therefore contract value for 1 Contract is \$100,000

The model shows that the real value of gold in the vault can be protected from swings in the gold price.

6.2.MODEL: THEORETICAL MODEL OF DE-DOLLARISATION

In this section we present a theoretical model which creates a dualised currency environment. We show what this model would look like if implemented at the commencement of formal dollarization (2009) and how this significant increase in money supply should improve the relationship with inflation, which we have already shown to be weak. Additionally, implementation of the model would also smooth out the volatility in money supply – both of which will be positive for the Zimbabwean economy. Inflation of course, will require other measures to prevent it from getting out of control; however in the short term we would expect productive capacity to soak up the excess dollars in circulation.

6.2.1. An asset backed refloat in this context means using an asset that has visible value as determined by some commonly used measure, benchmark, or market based price discovery mechanism. In this case we have selected gold for reasons already addressed in this paper. Gold will be collected in physical form and held in vault by the Reserve Bank and stamped as bullion.⁵

6.2.2. Based on the amount of gold collected on a month to month basis, the RBZ would issue new ZWD notes in quantity determined by an exchange rate estimated by the RBZ. The notes will be a representation of the gold held by the RBZ. In our model we have assumed an exchange rate of 0.01 to the USD, pegged to the value of gold and based on the number of notes initially printed to represent the gold collected in vault. New notes would be injected into the economy via the operations of the central bank. Because of demand and supply dynamics which are already in play, there will exist a notional value for the Zimbabwe dollar, this would be difficult to calculate and for now is beyond the scope of this paper.

6.2.3. Simultaneously, a barrier option would be written which protects the gold reserve's value from downside risk through the 'put option' leg, and appreciation risk which could erode export competitiveness (appreciation of the ZWD) through the sale of a 'call option'. Essentially the gold reserves value would be predetermined within a band

⁵ London Bullion Market Association provides the standard for gold quality by issuing a stamp which standardises gold content level.

set by the barrier option, described earlier, technically and loosely indexed to the spot price of gold. By subscribing to a derivative instrument, the RBZ would not be able to issue more currency than what is required under the semi-pegged exchange rate regime. This would be until such time that more reserves are collected, which would reset the barrier option levels. Any conversion of gold reserves on the upside would sit in the RBZ as foreign currency reserve whose value would be stated as 'Assets' on the central bank's balance sheet.

6.2.4. The second step requires a form of local bank bailout, where the RBZ injects capital intended for specifically long term lending creating a ZWD based liability environment. This, in part, would be facilitated by direct injections with the expectation that foreign banks will loosen their lending requirements in order to maintain competitive pace with local banks. The money market would also need to be denominated in local currency. As this paper has explained, the long term rate discovery is dependent on the short term money market environment. In short, a ZWD based yield curve needs to be created. The repurchase rate will also be designated for ZWD liabilities.

6.2.5. Monetary Policy Transmission mechanism

- a. Gold Royalties are collected by the reserve bank in bullion format
- b. Notes printed in ZWD format which are backed as claim on that gold
- d. Exchange rate is set at 0.01 to the USD
- c. Notes are injected into the economy via central bank transmission

The process effectively increases the amount of overall dollars in the economy, which should smooth out M3 volatility – allowing for the improved efficiency in other economic determinations, such as the distribution of credit, the establishment of rates.

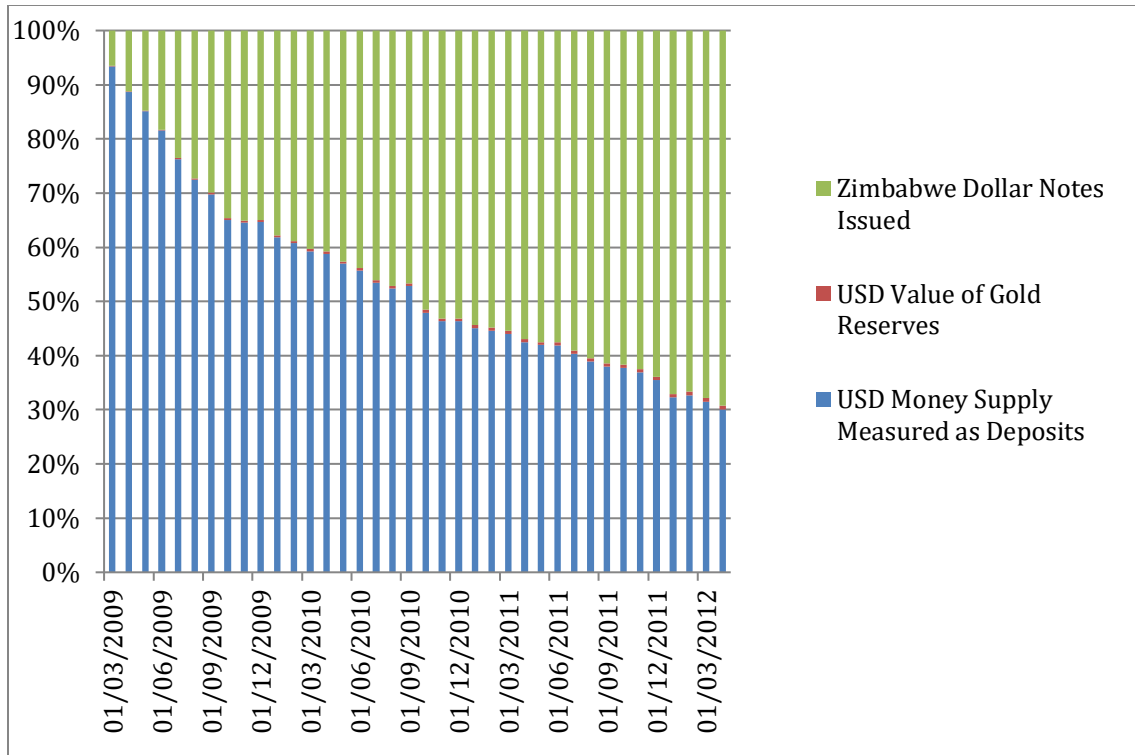


Figure 19 Data Source. RBZ and Ministry of Finance Gold Royalty Figures

The chart above is a representation of the percentage make-up of US Dollars, Gold Reserves and ZWD if gold reserves are used to back the printing of new ZWD using an exchange rate of 0.01. By 2010, half of the notes in circulation would be ZWD, by 2013 over 80% of money in circulation would be ZWD.

6.2.6. Money Supply (M3) Smoothing

It not enough to just reintroduce ZWD, we have to understand its effect on M3 volatility. In our model we back test the effect of now increased M3 by adding our new ZWD to USD which is already in circulation. We use our observations to see if this new money has had the impact of smoothing out M3 volatility over the period of dollarisation.

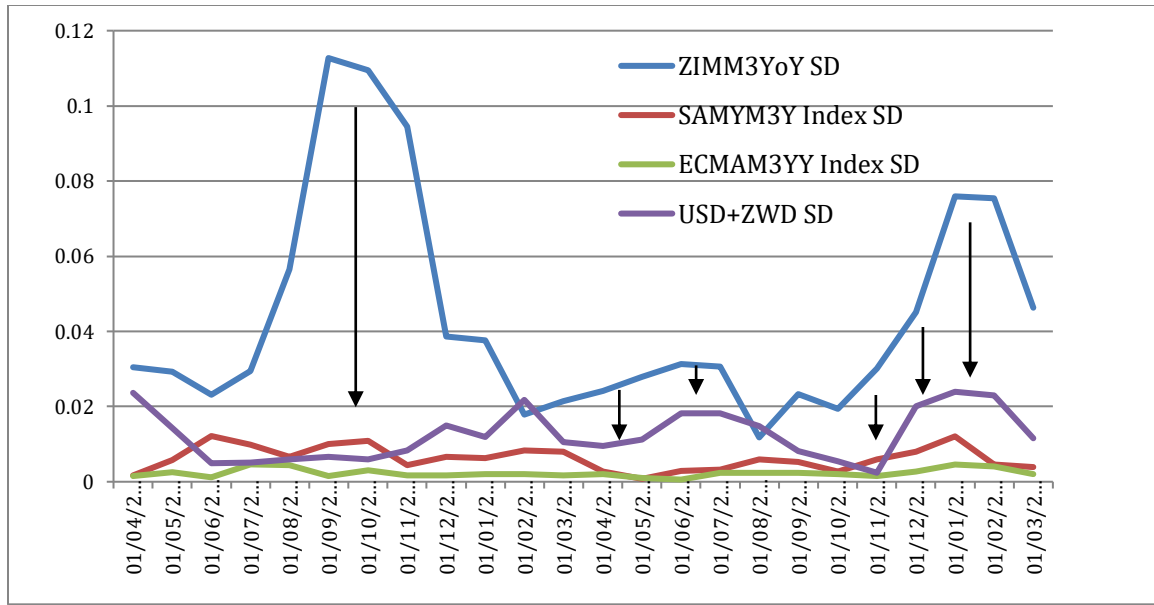


Figure 20 Data Source. RBZ and Ministry of Finance Gold Royalty Figures

The blue line is the rolling volatility of the already existing USD in circulation (as shown above) as a consequence of dollarisation. The purple line is the addition of the ZWD to the dollarised environment and the effect it has on volatility measured quarterly over the period. The result is a significant decline in M3 volatility, the smoothing effect as anticipated. An outcome that would be very positive for the Zimbabwean economy. This would certainly support a case for re-introducing the ZWD.

6.2.7. Counteracting the movement in the gold price

Movement in the gold price would have a direct effect in the level of M3 due to the gold peg. The value of the gold price would be protected by barrier option which ensures that the value of the gold reserves in dollars is maintained. This would mean the value in ZWD would be maintained. The barrier option involves knock out calls and puts which are triggered when the price of gold rises or falls above a certain level. Effectively if the price of gold breaches a set level, gold is sold in the market and dollars are maintained in reserve. Conversely, if the price of gold falls below a particular level a put option comes into effect protecting the value of the physical position. The barrier maintains the value of the gold reserve less the premiums paid for the contracts.

6.2.8. Effect of new M3(USD existing plus ZWD new) on Inflation

The inflation relationship shows very small changes which can be considered insignificant as shown below. This is due to the lack of linkages between prices and money supply

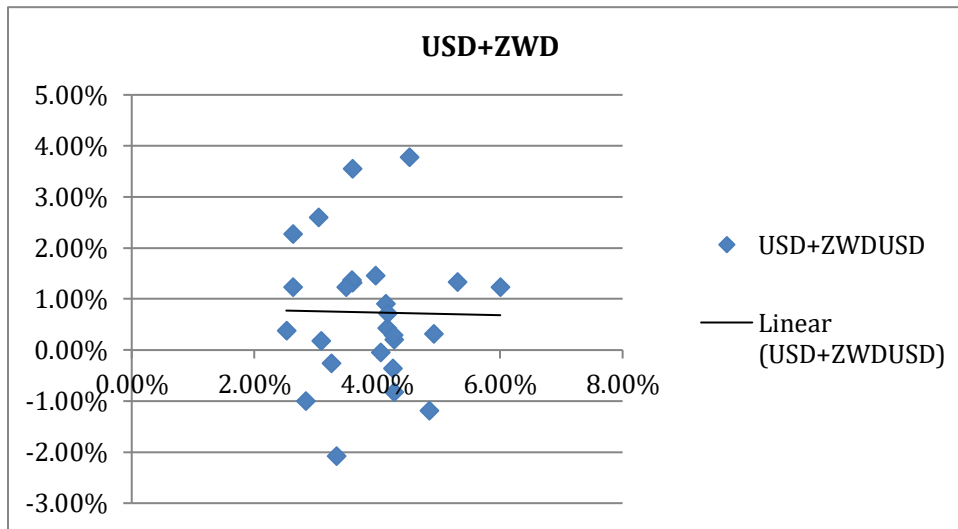


Figure 21 Data Source. Data Source. RBZ and Ministry of Finance Gold Royalty Figures

The model suggests that so long as there is strong economic reliance on South Africa, Zimbabwean inflation, even in the face of ZWD introduction and adjustments to inflation through new money, should remain stable and to an extent predictable. In each test the dependent variable is ZIMCPIYOY.

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	21.61529	6.571461	3.289266	0.003346
M3 + Gold	-5.8E-10	4.4E-10	-1.32821	0.197724
ZAR	0.304892	0.124864	2.441785	0.023115
SACPI	0.64796	0.068431	9.468862	3.23E-09

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>
Intercept	21.76028	40.7966	0.533385	0.599368
ZWD/ZAR	0.13262	13.65962	0.009709	0.992345
ZAR	0.341338	2.558311	0.133423	0.895129
SACPI	0.670692	0.080098	8.373401	3.93E-08
M3 + Gold	-5.9E-10	5.24E-10	-1.135	0.269164

This environment would likely prevail for a period until capacity utilisation is restored levels which would reflect improved demand vs supply metrics.

6.2.9. The Zimbabwe Dollar: Will it Work

The data we have examined shows that the refloat can reduce the volatility of money supply and inflation in the short-run is not impacted by the new dollars. However the ties to South Africa will still account for most of the movement in Zimbabwe price. The implementation of the ZWD cannot be done without other economic and institutional reforms which aid the creation of interest rate even if fixed for a period of time.

6.2.10. Limitations

Despite our confidence in soundness of the above theoretical model, based on the robust data analysis and testing, it is important to highlight that the main limitation is the use of 38 data points. This may affect the validity and levels of significance the overall model tries to achieve.

7. DISCUSSION

- **Economic Expectations**

In this paper we present the notion of a high production demand, which should in essence for some time offset the potential increases in inflation due to rising money supply. By implementing the new currency we can expect that the production demand money supply gap to close. This should also bring the spread between lending rates and deposit rates closer. Simply put, one can expect that as production utilisation rises, recorded through broad economic increases in capacity, share of short-term deposits to fall reflecting higher incomes and less of an inclination toward a cash economy. This should support improvements in the deposit money multiplier. Through seeing increases in private deposits, banks should be more inclined to lend. A greater supply of deposits should see a falling lending rate and in Zimbabwe, this is likely to lead to lower interest rates in general. In a market economy the primary benefit of low interest rates is the stimulative effect on economic activity, low rates also improve bank balance sheets and banks' capacity to lend (Neely, 2011) . Keeping short term interest rates low improves the banking industry's net interest margin, (i.e. borrow short and lend long with) which improves banks retained earnings and thus capital.

Earlier in the paper, we presented the benefits of low rates costs which must not be overlooked. In the long run low rates penalise savers. Another significant cost of low rates is risks to higher inflation. Arguably offsetting the inflation effect is the gold reserve, which must be translated into gold value. For instance, if inflation is running high in Zimbabwe, yet the gold price is steady or falling then the buying power of the new Zimbabwe dollar and the local inflationary increase offset themselves. In taking corrective action by adjusting the value of the gold reserve it will inturn adjust the value of the Zimbabwe dollar. Monetary instruments such as treasury bills can also be used in terms of sterilised and unsterilised effect dependent on which is needed at the time.

The signal for the shift to a new currency regime should occur when capacity utilisation is high and inflation variation is at levels deemed not suitable for the economy. At this

point the gold peg would need to be reviewed in order to avoid the deflationary effects of delinking the currency from this asset base.

Introducing a new currency through asset backing increases the supply of local money. Creating policy that promotes lending in the local economy will provide stimulus for financial deepening which will improve liquidity and thus interest rate discovery, encouraging the a de-dollarising effect. The establishment of a short-term rates through the money market will promote an environment of longer dated securities allowing for greater investment in capital projects, further dedollarisation should ensue. As the economy transitions away from reliance on neighbour imports as a result of increases in local productive capacity, we can expect further decreases in the variation of local prices, and a decreasing dependence of necessary goods from neighbour countries. Within this transition, dependency should move more toward local currency denominated outcomes rather than foreign; local currency denominated deposits should rise as percentage of total banking deposits due to a decline of interest rate spreads between lenders and depositors. Further confidence should be added to the financial economy by having a lender of last resort, whose inclination to mismanage is limited because derivative structures designed to protect the value of the reserve asset base prevent unplanned increases or decreases in money supply.

- **Policy Measures and Politics**

Perhaps the largest deterrent to investing in Zimbabwe is the incalculable nature of its political circumstances. No value can be applied to this risk as Zimbabwe has no sovereign rating on any long term assets. It serves as an impedient to predicting valuations especially when looking to risk free rates, cost of equity and costs of debt on assets. Additionally, it contributes in some part to the illiquid and stagnant nature of the Zimbabwean economy. Notwithstanding this, the philosophy of bringing back the ZWD looks beyond this. A number of stakeholders are involved in this process participating as checks and balances upon themselves. It is thus important to display some objectivity when considering this policy measure. The gold industry, administrators of the fiscal and

monetary policy, public and private sectors, and the populace at large, along with international financial institutions all have a role to play if such a plan were implemented.

8. CONCLUSION

We have described the fundamental reasons of why and how Zimbabwe became a dollarised economy. We have also explained the historical context and the rationale used in implementing a multicurrency environment. Furthermore, we have explored the strengths of the current financial environment which is low inflation, low transaction costs, restored financial predictability and generally, a level of confidence restored to financial institutions. In this paper, we have presented the weaknesses of the present financial environment, namely; the lack of a lender of last resort, a non-existent money market, and the irregular behaviour of lending and deposit rates. These have all resulted in an illiquid economy unable to respond to shocks, and responsible for low capacity utilisation and production. We have briefly described adverse selection issues which disincentivise lenders and discourage savers. This has provided intellectual support for the present environment stating that this dollarised environment does not show an relationship with other dollarised economies.

We have presented a model for de-dollarization through the reintroduction of the ZWD, which is backed and pegged to a gold reserve accumulated from entitlements to domestic gold production. The value of this reserve is shown to be protected by a barrier derivative structure which covers potential gains and losses on the gold index to which it is applied. We empirically show that changes in Zimbabwe's CPI can be accounted for by changes in the ZAR and South African consumer prices. Tests on new money show little impact on inflation. We have argued that in the short-run, injection of supply will be soaked up by productive capacity – at saturation points its likely we would witness a greater inflationary effect. It is at this point where we would expect the central bank to start relinquishing the peg. Numerous tests show that other variables may account for movements in inflation and GDP – therefore policy initiatives of liquidity creation by

bringing to life short to long term money markets should create wholesale improvements in the financial economy.

This paper has stated that politics cannot be ignored, however a level of objectivity is required when addressing the possible political impact of implementing such a plan. Many subscribe to the philosophy that a change in politics will result in a change in the wholesale standard of living in Zimbabwe. This paper does not endorse this belief but rather believes that this can be achieved by implementing key strategies that focus on developing the appropriate policy formation, and relevant change that addresses the current economic shortcomings. This would create an more efficient monetary environment which will ultimately create a foundation for a more stable future. We strongly argue that bringing back the ZWD would create such opportunities and have a positive impact on Zimbabwe's economy.

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13 APPENDIX A

Changes in CPI

Date	CPI (CHG)	Volatility
3/31/2009	-1.09%	
4/30/2009	-0.88%	
5/31/2009	0.56%	0.0089661
6/30/2009	1.00%	0.0098208
7/31/2009	0.44%	0.0029376
8/31/2009	-0.55%	0.0078016
9/30/2009	0.88%	0.0072837
10/31/2009	-0.11%	0.0072869
11/30/2009	0.44%	0.0049382
12/31/2009	0.76%	0.0043821
1/31/2010	0.97%	0.0026826
2/28/2010	1.17%	0.0020654
3/31/2010	0.11%	0.00566
4/30/2010	0.21%	0.005876
5/31/2010	-0.10%	0.0016051
6/30/2010	-0.11%	0.0018203
7/31/2010	-0.11%	1.103E-06
8/31/2010	0.11%	0.0012145
9/30/2010	0.21%	0.0016064
10/31/2010	0.42%	0.0016009
11/30/2010	-0.42%	0.0043595
12/31/2010	0.84%	0.0064019
1/31/2011	0.73%	0.0069614
2/28/2011	0.72%	0.0006569
3/31/2011	0.10%	0.0035982
4/30/2011	0.10%	0.0035832
5/31/2011	0.20%	0.00059
6/30/2011	0.10%	0.0005912
7/31/2011	0.33%	0.0011233
8/31/2011	0.84%	0.0038055
9/30/2011	0.13%	0.0036847
10/31/2011	0.50%	0.0035665
11/30/2011	0.21%	0.0019622
12/31/2011	0.46%	0.0015819
1/31/2012	0.49%	0.0015274
2/29/2012	0.43%	0.0003096
3/31/2012	0.19%	0.0015862

GDP Data

PX_LAST	Chg in GDP	Standard Deviation
6.679		
8.011	5.014264	
8.54	15.14367	
7.764	-11.00515	13.18450781
6.352	-5.498584	13.78517159
5.637	-8.883916	2.777362484
6.218	9.702238	9.899246974
6.741	11.8891	11.41450636
7.815	6.276536	2.82897768
8.286	16.59236	5.164585286
8.784	16.63855	5.969222441
8.641	-61.42657	45.0575923
6.751	-4.571958	40.366028
6.564	-36.1016	28.48367957
6.891	20.07339	28.15771796
7.111	31.32273	36.12067381
8.553	4.931345	13.24345234
8.53	-371.8696	225.5509757
6.402	-4.008459	215.0118757
6.858	14.03947	217.7817363
6.69	-40.82143	27.96021344
6.777	76.89655	58.90423547
6.342	-15.57931	61.97643703
5.728	-10.32899	51.94170786
5.806	73.4359	49.94635369
5.755	-113.8431	93.81290945
5.444	-18.50482	93.64465377
5.292	-35.81579	50.78932088
4.416	-6.041096	14.95296197
6.133	2.571928	20.1425478
7.433	4.717692	5.694149127
9.656	3.34368	1.086877566
10.814	8.338515	2.580266189

Zimbabwe CPI

	Zimbabwe	South Africa	USA	Euro-Area	China
1/31/2010	-4.8	6.1	1.6	0.9	1.5
2/28/2010	-0.7	5.7	1.3	0.8	2.7
3/31/2010	3.5	5.2	1.1	1.6	2.4
4/30/2010	4.8	4.8	0.9	1.6	2.8
5/31/2010	6.1	4.6	0.9	1.7	3.1
6/30/2010	5.3	4.1	0.9	1.5	2.9
7/31/2010	4.1	3.7	0.9	1.7	3.3
8/31/2010	3.6	3.5	0.9	1.6	3.5
9/30/2010	4.2	3.1	0.8	1.9	3.6

10/31/2010	3.6	3.4	0.6	1.9	4.4
11/30/2010	4.2	3.5	0.8	1.9	5.1
12/31/2010	3.2	3.5	0.8	2.2	4.6
1/31/2011	3.5	3.7	1	2.3	4.9
2/28/2011	3.1	3.7	1.1	2.4	4.9
3/31/2011	2.7	4.1	1.2	2.7	5.4
4/30/2011	2.7	4.3	1.3	2.8	5.3
5/31/2011	2.52	4.5	1.5	2.7	5.5
6/30/2011	2.84	5	1.6	2.7	6.4
7/31/2011	3.26	5.2	1.8	2.6	6.5
8/31/2011	3.47	5.4	2	2.5	6.2
9/30/2011	4.31	5.7	2	3	6.1
10/31/2011	4.2	6	2.1	3	5.5
11/30/2011	4.28	6.2	2.2	3	4.2
12/31/2011	4.93	6.1	2.2	2.7	4.1
1/31/2012	4.26	6.3	2.3	2.7	4.5
2/29/2012	4.24	6.1	2.2	2.7	3.2
3/31/2012	4	6	2.3	2.7	3.6
4/30/2012	4.06	6.1	2.3	2.6	3.4
5/31/2012	4.02	5.7	2.3	2.4	3
6/30/2012	4.02	5.5	2.2	2.4	2.2
7/31/2012	3.94	4.9	2.1	2.4	1.8
8/31/2012	3.65	4.9	1.9	2.6	2
9/30/2012	3.19	5.4	2	2.6	1.9
10/31/2012	3.35	5.6	2	2.5	1.7
11/30/2012	2.98	5.6	1.9	2.2	2
12/31/2012	2.9	5.7	1.9	2.2	2.5
1/31/2013	-0.33	5.4	1.9	2	2
2/28/2013	2.98	5.9	2	1.8	3.2
3/31/2013	2.76	5.9	1.9	1.7	2.1
4/30/2013	2.49	5.9	1.7	1.2	2.4
5/31/2013	2.2	5.6	1.7	1.4	2.1
6/30/2013	1.87	5.5	1.6	1.6	2.7
7/31/2013	1.25	6.3	1.7	1.6	2.7
8/31/2013	1.28	6.4	1.8	1.3	2.6
9/30/2013	0.86	6	1.7	1.1	3.1
10/31/2013	0.6	5.5	1.7	0.7	3.2

M3 Money Supply

	Zimbabwe	South Africa	USA	Euro-Area	China
1/31/2010	-4.8	6.1	1.6	0.9	1.5
2/28/2010	-0.7	5.7	1.3	0.8	2.7
3/31/2010	3.5	5.2	1.1	1.6	2.4
4/30/2010	4.8	4.8	0.9	1.6	2.8
5/31/2010	6.1	4.6	0.9	1.7	3.1
6/30/2010	5.3	4.1	0.9	1.5	2.9
7/31/2010	4.1	3.7	0.9	1.7	3.3
8/31/2010	3.6	3.5	0.9	1.6	3.5
9/30/2010	4.2	3.1	0.8	1.9	3.6
10/31/2010	3.6	3.4	0.6	1.9	4.4
11/30/2010	4.2	3.5	0.8	1.9	5.1
12/31/2010	3.2	3.5	0.8	2.2	4.6
1/31/2011	3.5	3.7	1	2.3	4.9
2/28/2011	3.1	3.7	1.1	2.4	4.9
3/31/2011	2.7	4.1	1.2	2.7	5.4
4/30/2011	2.7	4.3	1.3	2.8	5.3
5/31/2011	2.52	4.5	1.5	2.7	5.5
6/30/2011	2.84	5	1.6	2.7	6.4
7/31/2011	3.26	5.2	1.8	2.6	6.5
8/31/2011	3.47	5.4	2	2.5	6.2
9/30/2011	4.31	5.7	2	3	6.1
10/31/2011	4.2	6	2.1	3	5.5
11/30/2011	4.28	6.2	2.2	3	4.2
12/31/2011	4.93	6.1	2.2	2.7	4.1
1/31/2012	4.26	6.3	2.3	2.7	4.5
2/29/2012	4.24	6.1	2.2	2.7	3.2
3/31/2012	4	6	2.3	2.7	3.6
4/30/2012	4.06	6.1	2.3	2.6	3.4
5/31/2012	4.02	5.7	2.3	2.4	3
6/30/2012	4.02	5.5	2.2	2.4	2.2
7/31/2012	3.94	4.9	2.1	2.4	1.8
8/31/2012	3.65	4.9	1.9	2.6	2
9/30/2012	3.19	5.4	2	2.6	1.9
10/31/2012	3.35	5.6	2	2.5	1.7
11/30/2012	2.98	5.6	1.9	2.2	2
12/31/2012	2.9	5.7	1.9	2.2	2.5
1/31/2013	-0.33	5.4	1.9	2	2
2/28/2013	2.98	5.9	2	1.8	3.2
3/31/2013	2.76	5.9	1.9	1.7	2.1
4/30/2013	2.49	5.9	1.7	1.2	2.4
5/31/2013	2.2	5.6	1.7	1.4	2.1
6/30/2013	1.87	5.5	1.6	1.6	2.7
7/31/2013	1.25	6.3	1.7	1.6	2.7
8/31/2013	1.28	6.4	1.8	1.3	2.6
9/30/2013	0.86	6	1.7	1.1	3.1
10/31/2013	0.6	5.5	1.7	0.7	3.2

ZIMM3YoY SD	USD+ZWD SD	Inflation Yoy	SAMYM3Y Index SD	ECMAM3YY Index SD
0.030545154	0.023714898	0.012043166	0.00167	0.001527525
0.029220378	0.014319601	0.005818413	0.005755	0.002516611
0.023227278	0.004960216	0.00931417	0.012162	0.001154701
0.029395266	0.005180089	0.008719862	0.00981	0.004618802
0.056449451	0.005904112	0.003627791	0.006555	0.004358899
0.112726197	0.006605277	0.003946578	0.010041	0.001527525
0.109436783	0.00588525	0.003641155	0.010815	0.003
0.094463326	0.008413779	0.004465146	0.004409	0.001732051
0.038672977	0.015005435	0.004885482	0.006621	0.001732051
0.037566973	0.011941404	0.001245662	0.00635	0.002081666
0.017823717	0.021740516	0.003561679	0.008372	0.002081666
0.021370342	0.010480103	0.002645435	0.007922	0.001732051
0.024089137	0.00947053	0.000645812	0.002787	0.002081666
0.027889236	0.011262483	0.00161328	0.000777	0.001
0.03127406	0.018183731	0.002672369	0.002854	0.00057735
0.030556326	0.018194224	0.003360442	0.003176	0.002309401
0.01178979	0.014826765	0.006115828	0.005952	0.002309401
0.023363469	0.008134199	0.004193046	0.005208	0.002309401
0.019376679	0.005426853	0.000489646	0.002631	0.002
0.030179553	0.002400434	0.004073408	0.005977	0.001527525
0.045047519	0.020026303	0.003311738	0.008041	0.002645751
0.075950332	0.023937652	0.003249316	0.012155	0.00450925
0.075477892	0.022997842	0.002791538	0.004539	0.004041452
0.046340022	0.011627208	0.001584181	0.003853	0.002081666

Model for ZWD Introduction

Date	USD Money Supply Measured as Deposits	USD Value of Gold Reserves	Zimbabwe Dollar Notes Issued
3/31/2009	399,800,000	278,729	27,872,856
4/30/2009	490,500,000	618,506	61,850,639
5/31/2009	596,700,000	1,036,608	103,660,819
6/30/2009	709,700,000	1,593,989	159,398,880
7/31/2009	784,900,000	2,428,375	242,837,517
8/31/2009	862,000,000	3,242,186	324,218,562
9/30/2009	969,300,000	4,153,931	415,393,051
10/31/2009	991,700,000	5,282,373	528,237,293
11/30/2009	1,200,000,000	6,516,325	651,632,545
12/31/2009	1,400,000,000	7,562,828	756,282,828
1/31/2010	1,407,800,000	8,608,007	860,800,699
2/28/2010	1,500,000,000	9,601,438	960,143,810
3/31/2010	1,610,000,000	10,947,965	1,094,796,458
4/30/2010	1,750,000,000	12,134,502	1,213,450,173
5/31/2010	1,800,000,000	13,468,594	1,346,859,434
6/30/2010	1,900,000,000	14,981,170	1,498,116,976

7/31/2010	1,917,700,000	16,559,614	1,655,961,389
8/31/2010	2,040,200,000	18,347,586	1,834,758,589
9/30/2010	2,289,500,000	20,173,343	2,017,334,343
10/31/2010	2,070,700,000	22,251,321	2,225,132,062
11/30/2010	2,137,800,000	24,517,737	2,451,773,722
12/31/2010	2,327,600,000	26,726,587	2,672,658,724
1/31/2011	2,361,900,000	28,478,141	2,847,814,088
2/28/2011	2,458,100,000	30,261,377	3,026,137,705
3/31/2011	2,578,200,000	32,450,636	3,245,063,624
4/30/2011	2,600,000,000	34,910,405	3,491,040,519
5/31/2011	2,733,600,000	37,465,126	3,746,512,558
6/30/2011	2,899,700,000	39,765,443	3,976,544,276
7/31/2011	2,907,000,000	42,665,776	4,266,577,586
8/31/2011	2,952,400,000	45,925,745	4,592,574,493
9/30/2011	3,029,300,000	49,070,283	4,907,028,344
10/31/2011	3,211,900,000	52,442,587	5,244,258,713
11/30/2011	3,300,000,000	55,913,173	5,591,317,338
12/31/2011	3,300,000,000	59,497,627	5,949,762,664
1/31/2012	3,100,000,000	64,436,386	6,443,638,605
2/29/2012	3,380,000,000	68,969,540	6,896,953,959
3/31/2012	3,438,600,000	74,167,670	7,416,767,041
4/30/2012	3,453,600,000	79,346,985	7,934,698,534

Date	Yoy Inflation	Yoy % change in M3	Yoy Chg in ZAR	Yoy Chg in SACPO	
3/31/2010	3.60%	7.33%	-23.34%	5.11%	
4/30/2010	4.85%	8.70%	-13.35%	4.80%	
5/31/2010	6.01%	2.86%	-3.38%	4.60%	0.030545154
6/30/2010	5.31%	5.56%	-0.56%	4.21%	0.029220378
7/31/2010	4.16%	0.93%	-5.98%	3.70%	0.023227278
8/31/2010	3.60%	6.39%	-5.18%	3.50%	0.029395266
9/30/2010	4.28%	12.22%	-7.28%	3.21%	0.056449451
10/31/2010	3.59%	-9.56%	-10.44%	3.40%	0.112726197
11/30/2010	4.13%	3.24%	-4.07%	3.58%	0.109436783
12/31/2010	3.25%	8.88%	-10.39%	3.48%	0.094463326
1/31/2011	3.33%	1.47%	-5.78%	3.65%	0.038672977
2/28/2011	3.09%	4.07%	-9.68%	3.72%	0.037566973
3/31/2011	2.63%	4.89%	-7.01%	4.14%	0.017823717
4/30/2011	2.63%	0.85%	-11.10%	4.22%	0.021370342
5/31/2011	2.52%	5.14%	-11.32%	4.57%	0.024089137
6/30/2011	2.84%	6.08%	-11.75%	5.02%	0.027889236
7/31/2011	3.05%	0.25%	-8.31%	5.26%	0.03127406
8/31/2011	3.49%	1.56%	-5.19%	5.34%	0.030556326
9/30/2011	4.26%	2.60%	16.28%	5.69%	0.01178979
10/31/2011	4.18%	6.03%	13.73%	6.04%	0.023363469
11/30/2011	4.26%	2.74%	14.16%	6.12%	0.019376679
12/31/2011	4.92%	0.00%	22.04%	6.11%	0.030179553
1/31/2012	4.53%	-6.06%	8.70%	6.26%	0.045047519
2/29/2012	4.28%	9.03%	7.71%	6.12%	0.075950332
3/31/2012	3.97%	1.73%	13.27%	5.96%	0.075477892
4/30/2012	4.06%	0.44%	18.40%	6.12%	0.046340022

Date	Zim CPI	M3	ZAR	SACPI	M3 + Gold
3/31/2010	95.00	1610000000	7.29	111.10	1620947965
4/30/2010	95.10	1750000000	7.39	111.30	1762134502
5/31/2010	95.30	1800000000	7.67	111.50	1813468594
6/30/2010	95.20	1900000000	7.67	111.50	1914981170
7/31/2010	95.10	1917700000	7.30	112.20	1934259614
8/31/2010	95.00	2040200000	7.37	112.30	2058547586

9/30/2010	95.10	2289500000	6.96	112.40	2309673343
10/31/2010	95.30	2070700000	7.00	112.60	2092951321
11/30/2010	95.70	2137800000	7.10	112.80	2162317737
12/31/2010	95.30	2327600000	6.63	113.00	2354326587
1/31/2011	96.10	2361900000	7.19	113.50	2390378141
2/28/2011	96.80	2458100000	6.97	114.30	2488361377
3/31/2011	97.50	2578200000	6.77	115.70	2610650636
4/30/2011	97.60	2600000000	6.57	116.00	2634910405
5/31/2011	97.70	2733600000	6.80	116.60	2771065126
6/30/2011	97.90	2899700000	6.77	117.10	2939465443
7/31/2011	98.00	2907000000	6.69	118.10	2949665776
8/31/2011	98.32	2952400000	6.99	118.30	2998325745
9/30/2011	99.15	3029300000	8.10	118.80	3078370283
10/31/2011	99.28	3211900000	7.96	119.40	3264342587
11/30/2011	99.78	3300000000	8.11	119.70	3355913173
12/31/2011	99.99	3300000000	8.09	119.90	3359497627
1/31/2012	100.45	3100000000	7.81	120.60	3164436386
2/29/2012	100.94	3380000000	7.51	121.30	3448969540
3/31/2012	101.37	3438600000	7.67	122.60	3512767670
4/30/2012	101.56	3453600000	7.78	123.10	3532946985

Date	Zim CPI	ZWD/ZAR	ZAR	SACPI	ZWD/USD
3/31/2010	95.00	1.3727	7.29	111.10	10
4/30/2010	95.10	1.3534	7.39	111.30	
5/31/2010	95.30	1.3038	7.67	111.50	
6/30/2010	95.20	1.3036	7.67	111.50	
7/31/2010	95.10	1.3704	7.30	112.20	
8/31/2010	95.00	1.3561	7.37	112.30	
9/30/2010	95.10	1.4362	6.96	112.40	
10/31/2010	95.30	1.4288	7.00	112.60	
11/30/2010	95.70	1.4078	7.10	112.80	
12/31/2010	95.30	1.5085	6.63	113.00	
1/31/2011	96.10	1.3917	7.19	113.50	
2/28/2011	96.80	1.4350	6.97	114.30	
3/31/2011	97.50	1.4762	6.77	115.70	
4/30/2011	97.60	1.5224	6.57	116.00	
5/31/2011	97.70	1.4701	6.80	116.60	
6/30/2011	97.90	1.4773	6.77	117.10	
7/31/2011	98.00	1.4945	6.69	118.10	
8/31/2011	98.32	1.4303	6.99	118.30	
9/30/2011	99.15	1.2351	8.10	118.80	
10/31/2011	99.28	1.2563	7.96	119.40	
11/30/2011	99.78	1.2332	8.11	119.70	
12/31/2011	99.99	1.2361	8.09	119.90	
1/31/2012	100.45	1.2803	7.81	120.60	
2/29/2012	100.94	1.3322	7.51	121.30	
3/31/2012	101.37	1.3033	7.67	122.60	
4/30/2012	101.56	1.2858	7.78	123.10	

Date	Zim CPI	ZWD/ZAR	ZAR	SACPI	M3 + Gold
3/31/2010	98.10	1.3727	7.29	111.10	1620947965
4/30/2010	98.20	1.3534	7.39	111.30	1762134502
5/31/2010	98.41	1.3038	7.67	111.50	1813468594
6/30/2010	98.31	1.3036	7.67	111.50	1914981170
7/31/2010	98.20	1.3704	7.30	112.20	1934259614
8/31/2010	98.10	1.3561	7.37	112.30	2058547586

9/30/2010	98.20	1.4362	6.96	112.40	2309673343
10/31/2010	98.41	1.4288	7.00	112.60	2092951321
11/30/2010	98.82	1.4078	7.10	112.80	2162317737
12/31/2010	98.41	1.5085	6.63	113.00	2354326587
1/31/2011	99.24	1.3917	7.19	113.50	2390378141
2/28/2011	99.96	1.4350	6.97	114.30	2488361377
3/31/2011	100.68	1.4762	6.77	115.70	2610650636
4/30/2011	100.79	1.5224	6.57	116.00	2634910405
5/31/2011	100.89	1.4701	6.80	116.60	2771065126
6/30/2011	101.10	1.4773	6.77	117.10	2939465443
7/31/2011	101.20	1.4945	6.69	118.10	2949665776
8/31/2011	101.53	1.4303	6.99	118.30	2998325745
9/30/2011	102.39	1.2351	8.10	118.80	3078370283
10/31/2011	102.52	1.2563	7.96	119.40	3264342587
11/30/2011	103.04	1.2332	8.11	119.70	3355913173
12/31/2011	103.25	1.2361	8.09	119.90	3359497627
1/31/2012	103.73	1.2803	7.81	120.60	3164436386
2/29/2012	104.24	1.3322	7.51	121.30	3448969540
3/31/2012	104.68	1.3033	7.67	122.60	3512767670
4/30/2012	104.88	1.2858	7.78	123.10	3532946985

1122	956	10949	\$	11,374,472.17	\$	11,637,144.65	\$	262,672.48	2%	-	-	-	0	0
1122	956	10949	\$	11,374,472.17	\$	11,804,116.90	\$	429,644.73	4%	-	-	-	0	0
1122	956	10949	\$	11,374,472.17	\$	11,738,422.90	\$	363,950.73	3%	-	-	-	0	0
1122	956	10949	\$	11,374,472.17	\$	11,994,301.03	\$	619,828.86	5%	-	-	-	0	0
1122	956	10949	\$	11,374,472.17	\$	12,012,147.90	\$	637,675.73	5%	-	-	-	0	0
1122	956	10949	\$	11,374,472.17	\$	12,053,754.10	\$	679,281.93	6%	-	-	-	0	0
1122	956	10949	\$	11,374,472.17	\$	12,256,310.60	\$	881,838.43	7%	-	-	-	0	0
1122	956	10949	\$	11,374,472.17	\$	12,118,900.65	\$	744,428.48	6%	-	-	-	0	0
1122	956	10949	\$	11,374,472.17	\$	12,142,441.00	\$	767,968.83	6%	-	-	-	0	0
1122	956	10949	\$	11,374,472.17	\$	12,254,120.80	\$	879,648.63	7%	-	-	-	0	0
1122	956	10949	\$	11,374,472.17	\$	12,200,251.72	\$	825,779.55	7%	-	-	-	0	0
1122	956	10949	\$	11,374,472.17	\$	12,080,360.17	\$	705,888.00	6%	-	-	-	0	0
1122	956	10949	\$	11,374,472.17	\$	12,017,950.87	\$	643,478.70	5%	-	-	-	0	0
1122	956	10949	\$	11,374,472.17	\$	12,111,783.80	\$	737,311.63	6%	-	-	-	0	0
1122	956	10949	\$	11,374,472.17	\$	12,236,492.91	\$	862,020.74	7%	-	-	-	0	0
1122	956	10949	\$	11,374,472.17	\$	12,250,288.65	\$	875,816.48	7%	-	-	-	0	0
1122	956	10949	\$	11,374,472.17	\$	12,423,282.85	\$	1,048,810.68	8%	10	#####	11,374,472.17	Long Put	0
1122	956	10949	\$	11,374,472.17	\$	12,481,312.55	\$	1,106,840.38	9%	11	#####	11,374,472.17	Long Put	0
1122	956	10949	\$	11,374,472.17	\$	12,395,362.90	\$	1,020,890.73	8%	10	#####	11,374,472.17	Long Put	0
1122	956	10949	\$	11,374,472.17	\$	12,426,020.10	1,051,547.93	8%	11	#####	11,374,472.17	Long Put	0	
1122	956	10949	\$	11,374,472.17	\$	12,302,624.87	\$	928,152.70	8%	-	-	-	0	0
1122	956	10949	\$	11,374,472.17	\$	12,283,135.65	\$	908,663.48	7%	-	-	-	0	0
1122	956	10949	\$	11,374,472.17	\$	12,136,966.50	\$	762,494.33	6%	-	-	-	0	0
1122	956	10949	\$	11,374,472.17	\$	12,148,462.95	\$	773,990.78	6%	-	-	-	0	0
1122	956	10949	\$	11,374,472.17	\$	12,064,155.65	\$	689,683.48	6%	-	-	-	0	0
1122	956	10949	\$	11,374,472.17	\$	12,136,419.05	\$	761,946.88	6%	-	-	-	0	0
1122	956	10949	\$	11,374,472.17	\$	12,348,063.22	\$	973,591.05	8%	-	-	-	0	0
1122	956	10949	\$	11,374,472.17	\$	12,267,588.07	\$	893,115.90	7%	-	-	-	0	0
1122	956	10949	\$	11,374,472.17	\$	12,343,902.60	\$	969,430.43	8%	-	-	-	0	0
1122	956	10949	\$	11,374,472.17	\$	12,121,090.45	\$	746,618.28	6%	-	-	-	0	0
1122	956	10949	\$	11,374,472.17	\$	12,067,987.80	\$	693,515.63	6%	-	-	-	0	0
1122	956	10949	\$	11,374,472.17	\$	12,100,615.82	\$	726,143.65	6%	-	-	-	0	0
1122	956	10949	\$	11,374,472.17	\$	11,898,278.30	\$	523,806.13	4%	-	-	-	0	0
1122	956	10949	\$	11,374,472.17	\$	11,939,884.50	\$	565,412.33	5%	-	-	-	0	0
1122	956	10949	\$	11,374,472.17	\$	12,123,280.25	\$	748,808.08	6%	-	-	-	0	0
1122	956	10949	\$	11,374,472.17	\$	12,150,981.22	\$	776,509.05	6%	-	-	-	0	0
1122	956	10949	\$	11,374,472.17	\$	12,082,768.95	\$	708,296.78	6%	-	-	-	0	0
1122	956	10949	\$	11,374,472.17	\$	12,188,974.25	\$	814,502.08	7%	-	-	-	0	0

