

Preliminary Draft

A proposal for an exchange rate arrangement for commodity dependent countries: an application to Zambia

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IP 12.2 Exchange Rates

Abstract

This study illustrates a proposal for an exchange rate arrangement which could de link commodity dependent countries from the commodity price cycle and could promote long term development through export diversification. It highlights the trade off of exchange rate intervention in the commodity business cycle and emphasises the complexity of the management under a boom rather than under a burst. In the light of the management of the Zambian copper boom, this paper sets a taxonomy of objectives to be considered in formulating a band for the exchange rate and simulates different scenarios.

1. Introduction

As acknowledged by the literature on the resource curse, the best way to break away from the commodity trap is through a cautious and prudent macroeconomic management that could de link the economy from the commodity dependency. This entails a coordinated fiscal and monetary policy intervention counter cyclical to the commodity price cycle, in a way that when the economy is experiencing a commodity boom revenues are saved and foreign exchange accumulated so to use them in periods of falling commodity prices. Yet, if simple in words, the management is much more complex in reality, especially in the current context of developing countries which has been heavily shaped by the structural adjustment conditionality. In this environment fiscal saving is constraint by the urgent need for spending in infrastructure and investment that these economies bear; on the other hand, accumulation of foreign exchange may end up into inflationary pressure since sterilization is very costly. Thus at stake is how much foreign exchange and fiscal revenues should be saved and how much should be spent.

While the issue has been relatively widely studied when it comes to fiscal policy (see Bjerkholt, O. 2004, Budnevich, 2002, Davis, J., R. Ossowski, et al. 2001, Fasano 2000), analysis of the degree of foreign exchange intervention required for a commodity dependent country is still very limited. In this study we first illustrate the implications of a too strong and a too loose exchange rate management for commodity dependent countries. We highlight how complex the management becomes under a commodity boom and then indicate what has to be taken into account when formulating an exchange rate arrangement. Since we believe that such an arrangement has to be very country specific we consider it in the context of the Zambian economy.

The paper is divided into 5 sections. The following section gives an introduction of the complications of macroeconomic management in commodity dependent countries. Section three illustrates the dynamic of the arrangement and indicates a taxonomy of policy objectives to take into consideration when applying the arrangement. The fourth section indicates how the arrangement could be applied to Zambia. In the last section we conclude.

2. Commodity dependence and underdevelopment

The history of commodity dependence and underdevelopment is long dated and stems from the colonization era when developing countries were the main source of primary resources for the Western economies. UNCTAD data (2006) indicate that out of 141 developing countries, 95 are more than 50% dependent on commodity exports, and in sub-Saharan-Africa, as a whole, dependence reaches 80%. Moreover, many countries do depend on only one commodity.

What are then the implications of commodity dependency for developing countries?

These countries are totally exposed to the vagaries of commodity prices, which are much more volatile and exhibit larger fluctuations than other goods prices (Dehn 2000, Cashin and McDermott 2002, Pindyk 2004, Hewitt and Page 2001).

Being export receipts the main source of foreign exchange and occasionally the main source of government revenues¹, in commodity-dependent developing countries business cycle *has been dominated by the price movements of their major primary export commodities* (Nissanke 1993). When the commodity price goes down the country enters into a trade deficit which leads to a recession and most probably to a budget deficit which is aggravated by means of pro-cyclical fiscal policies. The budget is in fact financed through domestic borrowing which increases inflationary pressure and further determines a fiscal contraction in an already weakening economy, a dynamic that Gavin, Hausmann et al. 1996 express in terms of a vicious circle. Under a commodity boom, instead, the country experiences a trade surplus and, possibly, higher revenues, but if the foreign exchange is not absorbed the inflow leads to an appreciation of the currency with Dutch disease and construction booms kind of effects. These effects are detrimental for non traditional exports which are key for the long term development of a small open economy. In addition to these structural weaknesses and vulnerabilities, historical evidence demonstrates that developing countries have adopted inadequate macroeconomic policies, ... *typically booms do not translate into sustained increases in*

¹ This is to a different degree in countries dependent on agricultural commodities and countries dependent on mineral commodities, where resources tend to be more easily owned by the private sector. A relevant distinction has also to be made in term of number of people employed, since they tend to be much more in agriculture than in mineral extraction.

income – they are missed opportunities –whereas crashes produce devastating and long lasting declines. (Collier 2002). As Dehn (2000) indicates positive shocks have not had permanent effects on the economy and this is mainly due to inappropriate macroeconomic policies, which may entail Dutch disease but also excessive spending (*spending euphoria*) and also low-return investments due to *absorptive capacity bottlenecks* (Nissanke 1993).

3. A counter-cyclical arrangement

In formulating an exchange rate arrangement it is crucial to understand the main requirements of these economies. All in all, we believe that the country should de link its economy from the commodity price cycle, meaning that it should promote diversification which for a small open economy can be triggered more by export diversification².

Considering non traditional exports as the main, yet not only, focus of exchange rate management than the arrangement should require a tighter intervention under a commodity boom and a looser one under a burst. This is because commodity booms and bursts have different implications on non traditional exports. As already mentioned, under a boom the currency appreciation resulting from the inflow of foreign exchange can appreciate the real rate and create a resource switching from the tradable to the non tradable sector, since the tradable sector is less profitable (Dutch disease effect³). The adjustment to an equilibrium level of the exchange rate is then costly for non traditional exports, since it entails loss and reduction of their competitiveness. By this token, we believe that exchange rate intervention to prevent this is key. Under a commodity burst the trade deficit will depreciate the currency. If the economy has adopted a fixed

² The argument in favour of exports diversification is at odds with the idea of promoting a manufacturing base for the domestic market. This is because we are considering small economies where domestic demand cannot be the trigger for the economy, but rather external demand.

³ In its original formulation by Corden (1984), Dutch disease indicates the effect of a resource boom on the country's external competitiveness. This effect mainly occurs through two channels. An increase in export receipts raises income and demand which, in turn, raises the price level. As a consequence, the real exchange rate appreciates, as a unit of foreign currency now buys fewer "real" goods and services in the domestic economy than it did before (*spending effect*). As prices of traded goods are set in the international market, a rise in domestic demand induces an increase in the relative price of non-traded goods and a consequent resource transfer towards this sector at the expense of the traded sector (*resource movement effect*).

exchange rate regime, then it will require an incredible amount of foreign exchange reserves to maintain the peg,... *when a country is hit with reverse shocks, the depletion of its reserves can be too fast to permit an adequate pace of adjustment* (Nissanke 1993:63). As a consequence, the monetary authority may be forced to devalue in order to avoid a currency crisis, but devaluation can be costly for the economy, due to original sin and currency mismatch considerations. If the country has, instead, adopted a floating exchange rate regime, the currency will automatically depreciate, the current account will improve and non traditional exports will increase. Thus, under this circumstance it would be better for the economy to have a rather flexible arrangement.

An additional justification to the adoption of a mechanism which changes according to the commodity price cycle is in line with the fact that under a boom the exchange rate tends to be more volatile than under a burst (evidence for Zambia: work in progress). This increase in volatility may be associated to speculative capital flows that are consequent to a commodity boom, but also to a leverage effect which is specific to commodity prices, especially mineral commodity prices. Due to the presence of stocks, when the price of minerals increases then stocks may reduce and are not anymore used to buffer discrepancies between demand and supply, which instead occurs in the case of prices going down.

Ideally such an arrangement should be coupled with a consistent fiscal mechanism in which fiscal spending and saving behaviour are in accordance with central bank's intervention. As already mentioned, fiscal mechanisms have been more broadly studied than monetary ones, and a successful story is the case of Chile which in 2001 adopted a structural budget mechanism. According to this rule, every year the Ministry of Finance calculates a potential (structural) budget with reference to the output gap and to the medium term price of copper. Then expenditure is calculated with respect to the structural budget and not the actual one, so as to leave every year a 1% surplus:

Expenditure- structural budget=1% surplus

Since 2001, the country has accumulated incredible surpluses which have been accumulated in a sovereign fund offshore (Ministry of Finance 2007).

Implications under a commodity boom

Exchange rate management appears to be more delicate under a boom than under a burst; this is because, it is indeed under a positive shock of the commodity price that the opportunity for a long run development is at stake. Moreover, the management of increasing foreign exchange in small open economies exposes monetary authority to multiple trade-offs, which can be reflected in the choice between high inflation or high appreciation.

As illustrated by the theory and empirical evidence, counteracting an appreciation may indeed devalue the currency. Yet, this may have inflationary results through two main channels. First, if the import component in the CPI is relatively large and if there is a high pass-through from the exchange rate to domestic prices, a devaluation induced by exchange rate management may determine an increase of inflation. Second, when the country accumulates foreign exchange reserves and has no means to appropriately sterilize the inflow, inflation will emerge through excess liquidity.

Taxonomy of objectives for exchange rate intervention

In establishing the adequate degree of intervention in the foreign exchange market a country should set taxonomy of objectives. We believe that due to the strategic importance of non traditional exports, which are usually identified into agriculture, the first objective should be to maintain this sector competitive. Less crucial but still very relevant is the inflationary impact an exchange rate intervention may induce, through the channels previously mentioned. A third objective is the consideration of import competition that may arise when imports are too cheap with respect to domestic production. In small open economy, however, domestic production is less relevant than non traditional exports, although it bears welfare considerations. In this respect, we believe that the economy could be scarcely driven by domestic demand and emphasis should instead be stressed on external demand.

In a dynamic perspective, exchange rate intervention should also take into account also changes in the fundamentals. This aspect is quite crucial in the context of development. Usually for small open economies fundamentals are identified in the current account,

namely exports and imports, since the country is dependent on both. In a sense though, stating that the economy should break away from commodity dependence implies that the economy should change fundamentals, shifting from primary resources to alternative exports; and this is achieved through considering non traditional exports as the main focus of exchange rate policy.

However, within a development process the economy will soon or later move towards a more diversified economy, and probably the capital account will acquire relevance in the balance of payments. In this regard, when financial sector develops an exchange rate arrangement should progressively take into account a level of the domestic currency which could still attract foreign investors⁴.

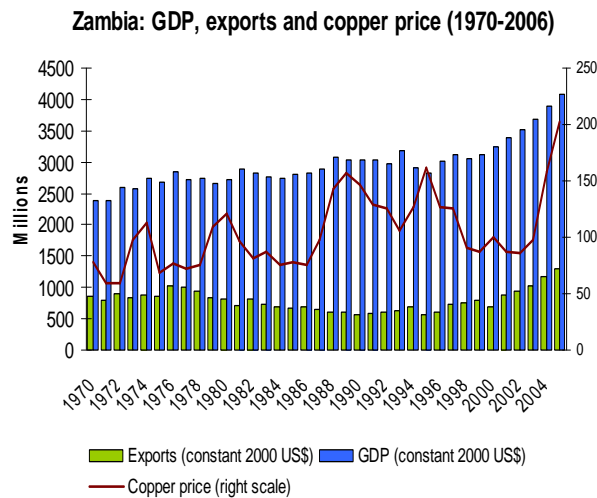
4. An empirical application to Zambia

In line with Frankel's statement "*no exchange rate regime is valid for all countries at all time*", the adequate degree of intervention to be applied under a commodity boom is considered with respect to Zambia.

Zambia's economy has undergone unforeseen changes since the early 2000s, due mainly to external factors and partly to domestic ones. After decades of state economy the country went through major reforms in the early 1990s, which liberalize trade, capital flows and foreign exchange and privatized all state owned enterprises. The process was one of the fastest in Africa, and the country was praised for the diligence it implemented the reforms by World Bank and IMF. Yet, the liberalization process did not generate the expected outcome, and mainly due to low copper prices, the country's economy stagnated for all the 1990s. In the early 2000s, the country managed to adjust fiscal imbalances through the application of a cash budget rule which drastically reduced inflation, and no expenditure was allow without the corresponding revenue. Macroeconomic fundamentals were in balance, yet growth still stagnated.

⁴ Two conditions need to be verified: first that the inflow of foreign capital is indeed channel into productive investments of the economy and does not remain idle in the banks, as it may be the case in developing countries where investments are very risky. Second, the relationship between exchange rate and interest rate should be better understood and check, for instance, whether the two are liked through uncovered parity condition.

Figure 10



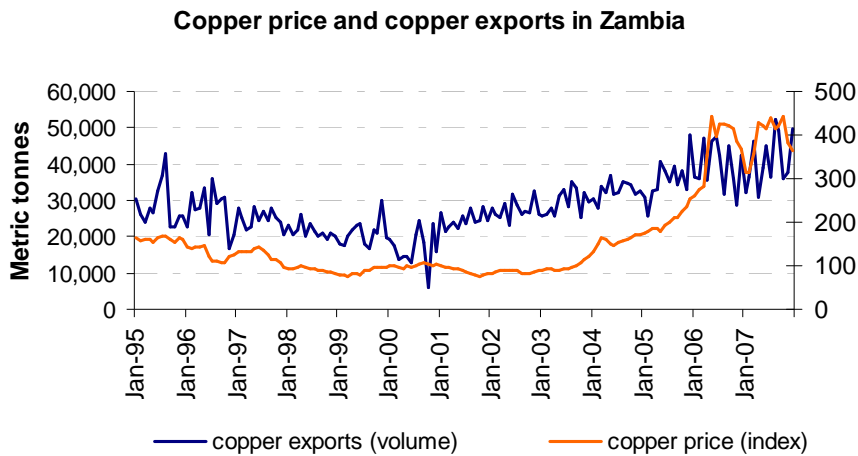
Source: author’s calculations from WDI, IMF-IFS data

In 2003 due to China and India’s demand for minerals dramatically increased the price of copper which resulted in an increase in Zambian copper exports but also in an appreciation of the Kwacha.

With respect to the appreciation Bank of Zambia intervened in spring 2005 up to August 2005, when they realized that the measure was becoming inflationary. Since then they almost stopped reserves accumulation. In addition, due to the positive macro-performance of the country, multilateral donors announced in June the approval for the debt relief for next December. The Multilateral Debt Initiative⁵ came as a surprise for the economy which fomented positive expectations and attracted capital flows. In November, the Kwacha appreciated strongly and this until February 2006, when it slightly depreciated. Expectations went down under the 2006 elections and this determined a weakening of the currency which after the election increased steadily to cause other appreciation.

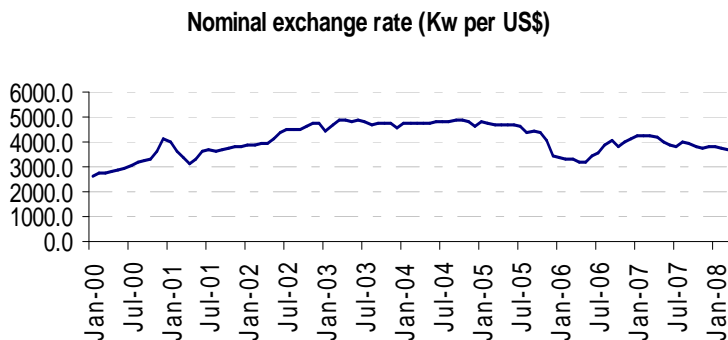
Figure 2

⁵ On the other hand, HIPC debt relief was largely expected and was given progressively and slowly



Source: IMF-IFS

Figure 3



Source: Bank of Zambia

Current monetary arrangement in Zambia

Since the early 1990s the country has adopted a flexible exchange rate with a monetary target for monetary policy. The target is broad money (M3) which comprises money in circulation and deposits in domestic and foreign currency. Yet, the operational target is reserve money which is what Bank of Zambia can manoeuvre of M3, and it is actually money held at the different commercial banks. Bank of Zambia manages liquidity through indirect and direct instruments, with a prevalence of indirect instruments while in the past they used more direct ones. The Bank withdraws and issues liquidity through

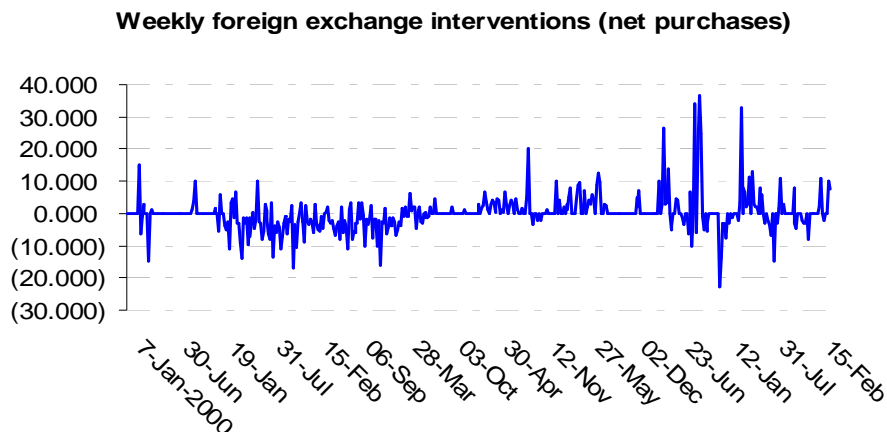
open market operations, i.e. through the issuance of government securities, which are treasury bills, and government and Bank of Zambia bonds of different maturities. Occasionally, the Bank modifies the reserve ratio and the liquidity ratio.

As stated by the Bank of Zambia Act, monetary policy is guided by the objective of maintaining price stability and allowing a stable macroeconomic development of the economy. Yet, the country has not an inflation target and they rely on the link between inflation and money supply, through reserve money. Every year the money target is set and calculating with the IMF, and it is part of the PRGF document of the IMF.

In terms of exchange rate policy, the Bank of Zambia acts indicates that the Bank can intervene only if it believes necessary to accumulate reserves, but excludes any other kind of intervention in the foreign exchange market. The market is now completely liberalized, a result achieved in 2003, with the opening of bureaux and intermarket mechanism, through which currencies are exchanged through commercial banks. Before 2003, large amounts of foreign currency could have been exchanged only by the Bank of Zambia. Moreover, all the companies have the right to retain 100% of their foreign exchange with no surrender obligation with respect to the Central Bank.

Under the IMF classification the Zambian exchange rate regime appears as a managed float, or slightly managed float. Evidence demonstrates that the Bank has been carried out interventions in the market. Yet, the objective appears to be more to lean against the wind and smooth volatility than to curb any spike in the value of the Kwacha. The intervention has also been very irregular which indicates the absence of a set of rules that guide exchange rate management; probably due to the pressure deriving from capital flows the Bank has not been able to curb volatility and has not been willing to curb appreciation, due to concerns on inflation.

Figure 4



Source: Bank of Zambia

Impact assessment of Bank of Zambia exchange rate management under a boom

How well has the current exchange rate regime performed under the copper boom?

Despite interventions, the current regime has not been able to reduce appreciation and volatility in the market. To assess thus how much this regime can impact on the economy we look primarily at the consequences on the real economy as well as on the financial market.

As far as the real economy is concerned, we are interested with assessing the impact on non traditional exports, on production for the local market and on the construction sector.

Non traditional exports

Preliminary statistical data illustrate that the non traditional export sector has been heavily struck by the appreciation which occurred in November 2005.

As indicated in the Audit Report compiled in 2007 by the Export Board of Zambia, non traditional exports comprise almost 25% of total exports in 2005, while they are below 20% in 2006. Moreover, while metal exports have grown by 86% in 2005-2006, non traditional exports grew only by 34%.

Figure 5

Zambian exports 2005-2006

	2005	%	2004-2006	%	2005-
	US\$'000	2005	US\$'000	2006	
ToT					
export	2,209.89	19.86%	3,841.30	73.82%	
Metal					
exp.	1,664.20	21.00%	3,084.10	87.57%	
NTEs	565.69	16.66%	757.2	33.85%	

Source: Export Board of Zambia

Yet, this increase in non traditional exports is due mainly to the surge in exports of engineering products, which are products processed out of copper. All in all, this sector is totally dominated by ZAMEFA⁶.

As far as the other groups of NTEs are concerned, the table below illustrates that agriculture is the second largest sector with a share in 2006 equal to 23%. In agriculture are considered tobacco, cotton, coffee and tea. Another relevant non traditional export is the production of processed food which is largely dominated by production of sugar. This sector has been heavily funded by the European PTA programme which has given almost X million euros to the sugar production. Less relevant with share on total NTEs between 6% and 3.30% are horticulture and floriculture, gemstones and tourism, manufacture and processed food, the latter mainly dominated by sugar production⁷.

Figure 6

Sectors	2005		2006		% change 05-06
	US\$'000	% NTEs	US\$'000	% NTEs	
Engineering	96,419	17.07%	288,592.	38.11%	199.31%

⁶ Since highly linked to the price of copper we doubt this could be a key sector for the country long term development, and believe that it should be probably excluded in the NTEs. Yet, it is still noticeable that what was manufactured abroad before, it is now being processed locally, and this has for sure positive spill over into the economy.

⁷ Sugar production is an interesting sector of the Zambian economy which has performed extremely well in the recent years and Zambia Sugar company has become one of the most competitive firm in the industry worldwide. The reason is also due to the fact that under the PTA the European Union is assisting the sector through large amounts of Aid.

products					
Agriculture	196,975	34.85%	176,913	23.36%	-10.19%
Processed					
Refined Food	66,933	11.83%	103,573	13.68%	54.74%
Floriculture	32,094	5.67%	17,839	2.36%	-44.42%
Horticulture	20,507	3.63%	23,024	3.04%	12.27%
Textiles	26937	4.76%	19,583	2.59%	-27.30%
Other					
manufactures	22,216	3.39%	24,512	3.24%	10.34%
Gemstones	31,607	5.59%	18,694	2.47%	-40.86%

Source: Export Board of Zambia

As shown by the table, some sectors experienced a decline in dollar export earnings in 2006, if considered in Kwacha terms the decline in earnings are much more. While for gemstones and textiles evidence is mixed, appreciation has been definitely a determinant of the reduction in agriculture and floriculture. Additional evidence gathered through interviews illustrates that sectors like cotton, coffee and tobacco have been particularly hit by the appreciation. We report a box for cotton.

Cotton production in Zambia

The cotton sector is one of the largest sectors of agriculture in terms of number of people employed, which in 2005 ranged to 300,000 to 280,000 people. Being completely managed by small scale farmers it is estimated that each registered farmer employs and involves a household of 6 people, thus the number of people depending on this crop is much more. The sector in 2005 produced to 155,215 MT, of which almost 95%. The sector is organized in a two-layer sort of production, through export growing schemes, where large commercials⁸ distribute to farmers inputs of production and then they buy their harvest at lower prices⁹. Commercial then export the harvest to the rest of the world

⁸ These are Dunavant and Lohrno.

⁹ To be precise the companies rely on distributors which are the link with the farmers and the farmers have to respond directly to the distributors.

(mainly Far East and South Africa). Besides labour, which comprises almost 40% of the costs, inputs of production in the sector are mainly seeds, which are obtained from ginning out of the previous years crops, and chemicals which are imported and paid directly in dollars. Seeds and chemicals together amounts at less than 50% of total costs of production, and the remaining is comprised by oil, transport costs and administrative costs.

In terms of currency mismatch, in 2005 86% of the costs were in Kwacha and the remaining in dollars, whereas earnings were 96% in dollars and only 4\$ in Kwacha, due to vegetable oil sold in the local market¹⁰. While chemicals costs and seeds costs have only recently increased (since 2007), labour costs increase every year to account for higher inflation, and again in November 2005 they increased by almost 10%.

The effects of the first Kwacha appreciation on the sector appeared in the crop year 2006-2007, since in 2005-2006 the seeds were already planted at the time of the production, and due to the schemes, everything had to be renegotiated and set again in the following year. As indicated by Dunavant, every year the company sets a preplanting price that in 2005 was set as 1,220 Kw per Kilo, due to the sharp appreciation in December 2005 the price had to be adjusted to a lower level, which was then expressed in dollars so as to hedge with respect to the Kwacha's volatility. Not surprisingly not many farmers quit their business in that year since they had already plant. However, cotton farmers dropped to below 200,000 in the following crop year. This determined either a shift to shorter term crop, like maize or wheat, or farmers just left their land idle.

An alternative arrangement for Zambia

From the implications just mentioned resulting from the current regime we believe the economy requires a stronger degree of intervention. In the establishment of a more

¹⁰ These are statistics provided by Dunavant and reflect Dunavant cost structure

intense management of the foreign exchange, we believe that Bank of Zambia's intervention should be oriented to the objectives indicated beforehand: competitiveness and profitability of non traditional exports, avoid inflation, avoid import competition and allow for changes in the fundamentals.

By this token, we believe that ideally Bank of Zambia should consider a band (explicit or implicit) within which the Kwacha is free to fluctuate and the Bank would intervene whenever the currency breaches the bounds of the band. The width of the band and the currency or currencies to consider in setting the bounds should be set according to the objectives previously mentioned.

As far as the reference currency to consider we believe that instead of a basket of currencies of trading partners a bound expressed simply in Kwacha per dollar will be more effective for two main reasons. First of all, most of the commodities exported are invoiced in dollars: coffee, cotton, tobacco, copper. Some of the commodities produced for the local market are also priced and exchanged in dollar terms as a form of hedging from the Kwacha volatility: maize, wheat and soya beans. Oil, the main imported good, is priced in dollars, although it is bought in Kwacha, and transport costs are really sensitive to dollar price of the oil. Although many imported goods, mainly manufactured ones, come from South Africa and Zimbabwe, there is another reason for considering a bound with respect to the dollar. This is because it will bestow more clarity to the arrangement and clarity is essential for traders and investors. A clear arrangement is more transparent and easy to be accounted for, increasing then the credibility of the Bank.

As far as the width of the band is concerned, we set different criteria for the lower and for the upper bound.

The lower bound.

The Bank should intervene whenever the Kwacha level with respect to the dollar is so low that it can endanger non traditional exports. How to set this bound?

In the calculation of the lower bound we take into consideration only exports of tobacco, cotton and coffee, although more general assumptions are also made for floriculture and

horticulture¹¹. We assume that the rate which is profitable for cotton, tobacco and coffee should be also profitable for the other sectors.

In setting the lower bound we calculate for every crop year the export earnings of tobacco, coffee and cotton. Since these commodities are denominated in dollars, export earnings are also in dollars, and they are given by the volume (MT) of exports multiplied by the current world commodity price at the time exports are sold. The earnings are then converted in the level of Kwacha at that time.

Kwacha earnings are then compared with respect to the cost structure. The amount of total costs is usually given by each sector (company) and then they are broken into inputs costs so as to allow for changes in costs structure when conducting simulations under alternative scenarios. Usually these costs entail labour, chemicals and fertilizers, seeds, oil and transport costs, and some generic administrative costs.

When the difference between Kwacha earnings and the Kwacha costs is small¹² that will be the rate at which Bank of Zambia should intervene.

As already mentioned, another indicator for setting the degree of intervention is given by the risk of import competition for local production. Thus we compare the Kwacha price of local production of wheat and soya bean with the import price in Kwacha and cif. In this case as well when the two become *closer*¹³ the Bank should intervene.

The upper bound

In the setting of the upper bound we believe that considerations of inflation are key.

As already mentioned inflation can be fuelled by exchange rate management through two channels. The first one considers the import component of the CPI and if this is high, there will be probably a high pass-through from the exchange rate to inflation. If this is the case, the upper bound should be relatively lower, since oil, which dominates domestic demand is imported and its price is crucial for the country and its economy. Moreover, if it emerges that inflation is mainly dominated by the import component, then this has implications on the current monetary framework which insists on the credit and money

¹¹ The problem with horticulture and floriculture is that they produce differentiated products and this may complicate the empirical analysis.

¹² This should be set according to data on year average earning in Zambia (..)

¹³ Setting a level for closer bears the same complications as setting a small level of export earnings.

channel for the liquidity management and neglects the exchange rate channel. Besides, inflation will probably results from accumulation of foreign reserves if these are not sterilized. Evidence illustrates that the Bank's potential to sterilize liquidity is low and they rely on the same practices to manage liquidity, mainly open market operations. Yet, if inflation is not driven by money demand, thus it is not linked to money supply, sterilization is not that much a problem and liquidity can increase to certain extend into the economy.

Changes in fundamentals

As already mentioned, the arrangement should be set in a way to allow for changes in the fundamentals. In this study we tried to investigate whether Zambia's fundamentals changed in a way that the current account was not the main determinant of the equilibrium exchange rate but also capital flows had become more relevant. If this is the case then the upper bound should be set in a way to maintain the Zambian market attractive for foreign investors. Yet, at first glance we doubt that the increase in capital flows emerged from the copper boom could have promoted an expansion of the financial market through productive investments in the economy. On the contrary the vast majority of these flows are highly speculative, and thus should not be taken into account in the arrangement. Besides, we believe that under a predefined arrangement speculators will be less aggressive and this will have positive consequences on the volatility of the currency.

Simulations under different scenarios

The arrangement should then be considered under different scenarios. These entail different oil prices and different primary commodities prices (like wheat, soya bean), as well as different fertilizers and chemicals prices, whose increase is a consequence of increasing agricultural commodity and oil prices. We compare the arrangement under the 2005-2006 context with the 2007-2008 one. Then we simulate scenarios with different prices.

Moreover, in the case of problematic sterilization we try to set a level of unsterilized reserves which will not end up into high inflation. Beyond this level we consider the accumulation into an offshore fund.

Conclusion

This paper presents a possible exchange rate arrangement to be used under a commodity boom, setting the criteria to be considered when calculating an upper and a lower bound for an exchange rate band. It provides theoretical justification for an arrangement which has the main purpose of de linking the economy from the commodity price cycle and promoting non traditional exports. We indicate how we intend to apply this mechanism to Zambia which is at present experiencing a copper boom, with Dutch disease and construction boom kind of effect and state that Bank of Zambia should intervene more if they had to safeguard non traditional exports. Also the complexity of exchange rate management for commodity dependent countries was highlighted.

All in all we believe that such mechanism could be exportable to other similar contexts.

References

Bank of Zambia, Annual Report 2004, Lusaka

Bank of Zambia Annual Report 2005, Lusaka

Bank of Zambia Annual Report 2006, Lusaka

Bjerkholt, O. (2004). "Fiscal Rule Suggestions for Economies with non-Renewable Resources." Paper for IMF/World Bank Conference on Rules-Based Fiscal Policy in Emerging Market Economies, Oaxaca, 14-16 February, 2002.

Budnevich, C. L. (2002). "Countercyclical Fiscal Policy. A Review of the Literature, Empirical Evidence and Some Policy Proposals." WIDER Discussion Paper 2002/42.

Cashin, P., C. J. McDermott, et al. (1999). "Booms and Slumps in World Commodity Price" IMF Working Paper 55.

Collier, P. (2002). "Primary Commodity Dependence and Africa's Future." mimeo World Bank.

Collier, P. and J. W. Gunning (1999). Trade shocks: Theory and Evidence. Trade Shocks in Developing Countries. P. Collier and J. W. Gunning. Oxford, Oxford University Press.

Corden, M. (1984). "Booming Sector and Dutch Disease economics: Survey and

consolidation." Oxford Economic Papers **36**: 359-380.

Davis, J., R. Ossowski, et al. (2001). "Stabilization and Saving Funds for Non Renewable Resources: Experience and Fiscal Policy Implications." IMF Occasional Paper **205**.

Deaton, A. (1999). "Commodity Prices and Growth in Africa." Journal of Economic Perspectives **13**(3): 23-40.

Dehn, J. (2000). "The Effects on Growth of Commodity Uncertainty and Shocks." World Bank Working Paper **2455**.

Fasano, U. (2000). "Review of the Experience with Oil Stabilization and Savings Funds in Selected Countries." IMF Working Paper **2000/112**.

Frankel, J. (1999). "No Single Currency Regime is Right for All Countries " Graham Lecture, Essays on International Finance, Princeton University Press **215**.

Gavin, M., R. Hausmann, et al. (1996). "Managing Fiscal Policy in Latin America and Caribbean: Volatility, Procyclicality and Limited Creditworthiness." Inter-American Development Bank Working Paper **326**.

Hausmann, R., U. Panizza, et al. (2001). "Why do countries float the way they float?" Journal of Development Economics **66**: 387-414.

Hewitt, A. and S. Page (2001). "World Commodity Prices: Still a Problem for Developing Countries?" mimeo ODI, Oversea Development Institute.

Pindyck, R. S. (1994). "Inventories and the Short-Run Dynamics of Commodity Prices." The RAND Journal of Economics **25**(1): 141-159.

UNCTAD (2006). The Least Developed Countries Report: Escaping the Poverty Trap. UNCTAD. New York, Geneva.