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Dynamic effects of terms of trade shocks in Suriname: the role of exchange rate

Nancy Ong-A-Kwie-Jurgens
nongakwie@cbvs.sr

Daniëlla Wondel
dwondel@cbvs.sr

Abstract

Downward shocks in international commodity prices can affect the terms of trade of developing countries that depend largely on the development of these prices. These negative terms of trade shocks can in turn disrupt economic growth. Many scholars claim that the exchange rate regime helps determine how the negative effect of the terms of trade translates through the economy. This paper investigates dynamic effects of the terms of trade and its interactions with the exchange rate regime in a developing country such as Suriname (1975-2018). The paper uses a constructed commodity price index as a methodology to measure the terms of trade's impact in Suriname, tested in a VAR framework. The results suggested that a negative term of trade shock appreciates the REER, because foreign capital declined increasing exchange rate pressure. This results in a decrease in purchasing power, which allows increasing inflation and eventually a decline in economic growth

1. Introduction

The severe impact commodity terms of trade have on macroeconomic variables, in particular economic growth, has recently gained renewed interest. Factually, commodity prices are found to drive real exchange rate fluctuations in developing countries especially, commodity-exporting countries (Chen and Rogoff, 2003; Cashin et al., 2004).

Cashin et al. (2000), stated that terms of trade shocks might occur due to the susceptibility of primary commodities to cyclical and fundamental demand and supply shocks.

They highlighted that an increase in the export of commodity exporting countries leads to a real appreciation of the country's exchange rate and vice versa. When there is a commodity boom, the appreciation of the commodity currency[1] benefits domestic consumers in the form of lower import prices (Clements et al.; 2008).

By exploring the case of Suriname as a commodity exporting country that depends heavily on international commodity prices, the authors want to investigate the terms of trade impact on the exchange rate. Lately, Suriname adopted a flexible exchange rate regime, which triggers the following questions: How does a regime switch help translate the shock? According to Anderson L. (2016), a flexible exchange rate regime allows a country to have an independent monetary policy, providing the economy with the flexibility to accommodate domestic and foreign shocks, including changes in external terms of trade and interest rates. Suriname also experienced a decline in economic growth in 2015 and 2016 (3.4; 5.6) caused by a drop in commodity prices. Therefore, the mechanism through which commodity price shocks passes-through the economy is of eminent importance and hence be tested in this research.

Two primary challenges are of concern in Suriname; firstly, its dependence on commodity exports and secondly, the impact of commodity price volatility on the economy. This dependency is a source for economic instability evidenced by exchange rate volatility. According to Bleaney (2001) volatility matters especially in countries most dependent on primary products (Bleaney, 2001). When economic instability occurs, it does not just cause derailment of the economy, but also ensures a shift in the focus of policy makers towards short-term foreign exchange interventions intended to tackle exchange rate instability. However, interventions may aggravate exchange rate volatility.

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[1] With commodity currency the authors refer to exchange rate because of the heavy dependence of countries on commodity export; the developed of world commodity prices likely determines value of the currency.

The aim of this research is to contribute to the insight of policy makers in small open developing countries regarding the impact of commodity terms of trade. Moreover, this research will contribute to the literature investigating the terms of trade shocks and its impact on economic growth and exchange rate. The paper uses a constructed commodity price index as a methodology to measure the terms of trade's impact in Suriname. Subsequently, the price index, combined with the identified variables become part of a VAR/VECM model.

The paper proceeds in Section 2 with a brief overview of the developments of commodity terms of trade in Suriname. Thereafter, an analysis of the theoretical and empirical literature follows. Section 4 elaborates on the methodological aspects such as the econometric approach, data collection and the obtained results. Finally, conclusions and policy recommendations follow in section 5.
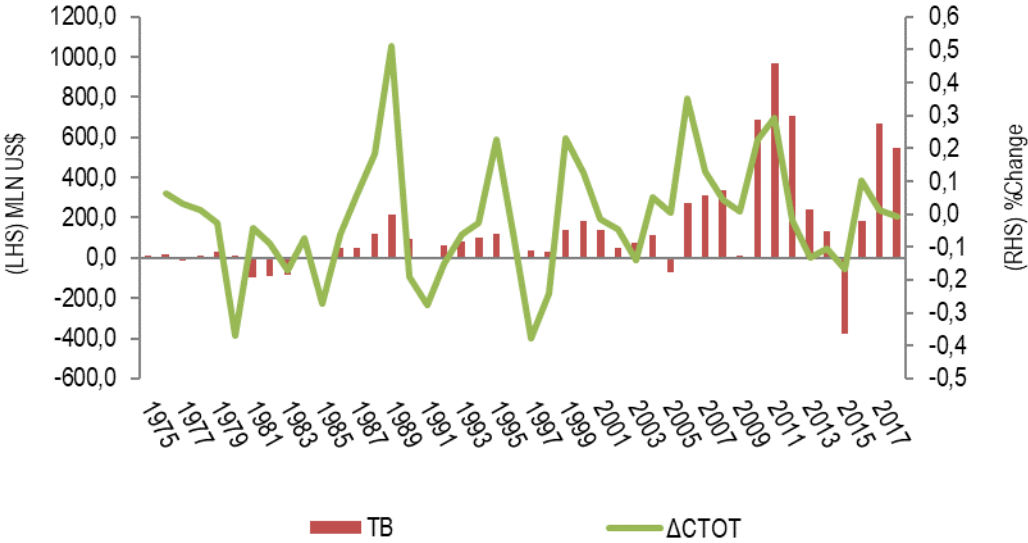
2. Developments of Terms of trade 1975-2018

Suriname experienced several episodes of surpluses on the trade balance of the Balance of Payments since 1975. These surpluses were on average 8.2% in terms of GDP and were mainly due to favorable commodity prices. Mining exports, that mainly drive these surpluses, account for on average 86% of the country's total exports. Mining commodities dominate the export basket since 1975 and consist of Bauxite (1975-1988), Aluminum (1975-1999), Alumina (1975-2016), Oil (1988- ongoing) and Gold (1997- ongoing). Non-mining commodities such as agriculture, fishery, timber, banana, and other commodities constitute the remainder of the basket (on average 14%).

The import basket consists of manufacturing goods, oil and oil products (mining imports) and consumption goods (non-mining imports). The imports of manufacturing goods of which capital goods relates to mining industry investments. There is a strong relationship between imports of capital goods and mining exports (r= 0.8). The imports of consumption goods on the other hand follow disposable income. In a case of stable exchange rate and stable inflation, disposable

income increases and triggers higher purchasing power leading to an increase of consumption-good import.

Figure 1: Developments of Terms of trade change and Trade balance

The development of terms of trade distinguishes three periods (1975-1986; 1987-1997; 1997-2018). Macro imbalances, political instability along with the side effect of low international commodity prices for the main export commodities, characterize the first period (1975 -1986). These imbalances were primarily the result of expansionary fiscal policy, which induced strong increases in imports (Central Bank of Suriname 1977). The negative commodity price shock resulting from the recession of the global economy in 1981 led to forced reductions of the production of the bauxite industry, which was the main export commodity of the Surinamese economy. Furthermore, continued increasing imports became a drag on both the trade balance and the country's foreign exchange reserves. The abovementioned developments resulted in a slight deterioration of the trade balance of US$ 10.7 million, reflecting a deterioration of the terms of trade with an average of 0.1% between "1975-1986" (see figure 1).

The expansion of the export basket with oil and gold, a positive commodity price shock, rising exports as well as high inflation and an overvalued exchange rate, characterizes the following

period (1987-1997). The trade balance made a positive turnaround after 1986, which was attributable to declining imports, arising from lower international oil prices caused by overproduction on the global market, and to higher exports on the account of both mining and non-mining products. Moreover, imports of oil declined due to the bauxite company. Firstly, their production declined which affected imports of oil and secondly they shifted from suppliers. The shift was from importing oil to purchasing from State Oil Company.

However, the period of overall export growth was disturbed in 1990 by rising inflation, which coincided with an overvalued exchange rate on the parallel market. The increased price for the U.S. dollar on the parallel market mainly occurred because of depletion of the international reserves, fiscal dominance and overvaluation of the local currency caused by domestic uncertainty. To improve and strengthen competitiveness of the export sector, the monetary authorities unified the exchange rate in July 1994. The unification resulted in recovery of tradable and the non-tradable sectors. Despite the growth in exports and decline in imports, the terms of trade worsened further between "1987- 1997". In 1988, Suralco (Surinam Aluminum Company; a subsidiary of Alcoa) seized bauxite exports, which may have worsened terms of trade.

The latter period (1997-2018), reflected a stable macro environment, recovered economic activities as well as favorable commodity prices. The trade balance was mainly in surplus for the period under discussion, except for the years 2005 and 2015. The export basket expands further with exports of gold, which currently account for almost 70 - 80% of the total commodity basket. Large-scale mining by Rosebel Gold Mines NV (a subsidiary of Iamgold), which started in 2004 contributed to the expansion.

In addition, export volume of alumina fell due to reduced demand and the departure of the multinational BHP Billiton from Suriname (2009). On the other hand, global uncertainty about the degree of economic recovery pushed the export price of gold up and limited the decrease of its total export value (Fritz-Krockow, et al. 2009). The international gold price rose by almost 67% over the next five years (2008-2013). Consequently, export revenues increased sharply resulting in the largest trade surpluses in history.

On the contrary, the international gold price started to show a downward trend at the end of 2013 causing export revenues to decline in the subsequent two years. In addition, Suralco's phasing-out of production also contributed to decreasing export receipts. , Aggravating the situation, imports of goods started to rise in 2015, partly due to construction activities of Newmont, a new gold mining company.

It is worth mentioning that the increasing gap between the official and the parallel exchange rate ultimately led to a devaluation of approximately 21% in 2015. In 2016, monetary policy shifted from a fixed to a flexible exchange rate.

In 2017, Newmont's production reached full capacity thus increasing both the volume and value of gold exports, ultimately improving the trade balance. On average, the terms of trade improves on the account of increasing exports and decreasing imports in the period under review.

3. Literature review

3.1. Theoretical & Empirical literature

An increasing body of literature focusses on the impact that terms of trade have on economies, particularly in developing countries. Baxter and Kouparitsas (2000) claim that the fluctuations in the terms of trade are much larger in developing countries than in developed countries stemming from the fact that the former countries heavily depend on the export of commodities. Prices of these exports are much more volatile than for example of manufactured goods. In addition, developing countries have a high degree of trade openness, which enhances vulnerability for large fluctuations in terms of trade affecting economic activity and output. Besides, Mendoza (1995) and Kose (2002) state that half of the output volatility of these countries is determined by fluctuations in the terms of trade.

Highlighted in the literature, are several channels through which terms of trade affect the economy. Mendoza (1997) identified that through savings the volatility of terms of trade affects consumption growth rate. By studying a model of savings under uncertainty, he provided an interpretation for the observed positive relationship between average rates of

change of terms of trade and average consumption growth rates. In the savings-under-uncertainty framework, risk-averse agents adjust their savings rate, and hence the trend level of consumption, in response to changes in the variability of the underlying process driving consumption fluctuations. His results stated that an increase of 1 percentage point in the rate of change of terms of trade increases the growth rate of consumption at import prices by 0.2% and that of consumption at domestic prices by about 0.05. According to Rodrick (1999), it is the interaction between institutions of conflict management with the terms of trade. With a sample, ranging from 1960-89 his study shows that when divided societies (e.g. unequal or ethnically fragmented) deal with weak institutions, the decline in growth is most abrupt. Roderick suggested that well-functioning institution could therefore reduce the severity of terms of trade shocks through the distribution channel. He highlighted that conflict diminish the productivity with which a society's resources are utilized such as by delaying needed adjustments in fiscal policies and key relatives prices and by diverting activities from the productive and entrepreneurial spheres to the political sphere. Strong institutions tend to mute political wishes. Roderick adds that if the appropriate adjustments are undertaken without an outbreak of distributional conflict, the shock could be managed with no long-lasting effects on the economy.

Jerzmanowski (2005) confirmed this statement of strong institutions that foster growth by implementing a Markow-switching model for 89 countries for 1962 until 1994. He argued that external shocks might inter-act with institutions in a highly nonlinear fashion to determine average growth of a country. The right policy move of the strong institutions spurs fast growth. Barro and Sala I-Martin (1995) mentioned the relative price changes on productivity as a channel on terms of trade shocks.

Another strand in the literature pointed out the importance of exchange rate regimes. According to Friedman (1953), flexible exchange rate regimes enable countries to absorb real shocks rather than fixed exchange rates. He argues that due to price stickiness the nominal exchange rate could be used to insulate the economy against real shocks. A depreciation of the currency makes export more competitive in the market resulting in rise of demand. Rising

demand in return will stimulate export activities, cushioning the negative impact of terms of trade on growth. According to Broda C. (2002), in countries with fixed exchange rate regimes, the output falls after a negative real shock until wages and prices fall (slowly) to a rate allowed by nominal stickiness. In countries with a flexible regime, on the other hand, the monetary authorities can have the currency depreciated in response to the shock. Because of the depreciation, the domestic price of the exported goods increases precisely when the international price of these goods has fallen and hence counteract the negative effect. Furthermore, a currency depreciation lowers real wages at precisely the time when labor demand drops, contributing to a smoother adjustment. Theory predicts that countries with flexible exchange rate regimes will be better able to adjust to terms of- trade shocks.

Broda tested Friedman's theory in several papers (2002, 2003 & 2004). For example, in his 2004 paper, , Broda demonstrated with a sample of 75 countries for 1973–1996, that the effect of a terms of trade shock on per capita income depends on the exchange rate regime. The results show, that the effect in countries with a flexible exchange rate is smaller than in countries with a fixed exchange. The relative prices tend to adjust faster through the nominal exchange rate in a flexible exchange rate environment, while in a fixed exchange rate regime the adjustment of relative prices may be slower. Calvo (2000); Ghosh et al (1997) IMF (1997) and more recently Cashin et al. (2000), stated that if primary commodities, which are susceptible to cyclical and fundamental demand and supply shocks, dominate countries' export it leads to terms of trade shocks. They highlighted that an increase in the export of commodity exporting countries leads to a real appreciation of the country's exchange rate and vice versa. When there is a commodity boom, the appreciation of the commodity currency benefits domestic consumers in the form of lower priced imports (Clements et al.; 2008). This is known is Dutch disease.

Rickne (2009) analysis the co-movements of oil price and exchange rate and the role of domestic legal and political institutions. He argues that oil-exporting countries with high bureaucratic quality and strong and impartial legal systems have real exchange rates that co-move less with the oil price movements. According to Rickne empirical studies on the growth rates of countries with abundant natural resources indicated that the greater the resource

endowment, the lower the level of economic growth (commonly known as "Dutch Disease"). One theoretical explanation for this paradoxical phenomenon is that the resource exporter's real exchange rate co-moves with highly volatile commodity prices, thus when commodity prices increase, the real exchange rate appreciates and undercuts the competitiveness of the domestic industry. In turn, the domestic nonrecourse industry base may fail to recover if the commodity price continues to decline over several price cycles.

However, Ubok-Udorm (1999) and Ekpo (1993) comment on the positive flexible exchange rate effect. Both argue that the improved effect of the devaluation or depreciation on export-output is not guaranteed; since devaluation may have contradictory effects depending on the elasticities of both import, demand and export supply. Devaluation or depreciation will lead to a rise in exports production costs particularly when exports production heavily depends on import inputs. This could lead to an increase of inflation with serious consequences for economic activity (Komolafe, 1996; EBRD, 2013). Eichengreen & Hausmann (1999) argued that in countries where the private and public sector have a big chunk of foreign currency denominated liabilities the flexible exchange rate regime would not offer any solution. It can actually exacerbate the negative impact of the terms of trade shocks, because when there is a balance sheet effect, the currency depreciation caused by the external shock will increase the value of debt in local currency. It therefore can trigger bankruptcies, leading to public sector insolvencies and result in a decline in economic growth (Calvo, 2002). Hence, Enwards (2003) suggested that to know if the exchange rate regime enables the economy to absorb external shocks and lead to economic recovery should be answered through empirical research.

In sum, it can be stated that channels through which terms of trade affect the country depends on savings, weak institutions and relative price changes on economic activity.

The majority of the literature highlighted that countries with a fixed exchange rate regime will adjust to terms of trade shocks via a contraction in output and depleting international reserves, while countries with a flexible exchange rate will adjust via a currency depreciation, which offsets the shock's negative effects on output.

4. Empirical Model

4.1. Model Specification

The focus of this paper is to measure the impact of terms of trade on the exchange rate against the background of fixed and floating exchange rate regimes in Suriname covering the period 1975-2018. The main motivation stems from the need to have a good knowledge of the impact of terms of trade shocks, what the transmission of this shock is, and to know how to minimize an ensuing negative impact

The variables that are considered in the research are the commodity terms of trade (CTOT), trade openness (TO), trade balance (TB), real gross domestic product (RGDP), broad money (M2), real effective exchange rate (REER) and consumer price index (CPI). These variables are chosen based upon the literature review and characteristics of Suriname. To test the impact of terms of trade on other variables a vector auto regression (VAR) technique is applied, representing the dynamic paths of the above mentioned variables. The equation can be presented as:

$$Y_t = \beta(Y_{t-1}) + C(X_t) + \epsilon_t$$

Where $Y_t = [A_t, C_t, E_t, F_t, R_t, G_t, D_t]$ is a seven-dimensional vector of endogenous variables and U_t the corresponding vector of reduced-form shocks, X_t denotes a vector of deterministic components that includes a constant and dummy variables. Dummy variables may play a significant role in the prediction or explanation of the dependent variable. Two dummy variables are considered. The first dummy captures exchange rate regime switch, whereas a fixed exchange rate regime corresponds with the number zero, while the dummy takes on the value one in a flexible exchange rate situation. The second dummy captures breaks in the sample. To minimize the effect that much is determined outside the model, control variables are introduced. Control variables are introduced in the model to minimize the effect of determinacy outside the model. Since some variables contained negative values when transformed into logarithmic values, equation 2 was applied to account for the negative values.

$$Log\ Y_t = \text{Log}(1 + {Y_t}/{100})\qquad\qquad (2)$$

4.2. Data analysis

The choice of variables is primarily determined by variables considered in theoretical debates, variables employed in empirical studies of developing countries and the availability of time series data. Quantitative data came from the Statistics Department of the Central Bank of Suriname and the World Bank database. Table one, presents a brief description of the variables used in this study.

Table1: Variable description and data sources

Variable	Description	Sources
TB	Trade balance	
CTOT	Commodity Terms of trade is meassured as the Weithed average of the commodity price index divided by the commodity import price index (USA CPI is used as a Proxy for Import price index)	CBvS and World Bank Data base
Exchange rate	The exchange rate variable used is the nominal exchange rate corrected with CPI of both USA (as main trading partner) and Suriname	CBvS and World Bank Data Base
CAB	Current account balance of Suriname Balance of Payment (both in nominal terms and GDP)	CBvS
IR	International reserves or Foreign Reserves of Suriname	CBvS
EXP	Exports of Goods	CBvS
IMP	Imports of goods	CBvS
TO	Trade openness is measured as a ratio of trade shares, Exports plus Imports as share of GDP	CBvS and authors own calculation
GDPmp (Real)	Real GDP	General Bureau of statistics
M2	Broad money	CBvS

The literature presents many calculations of terms of trade. It starts with the calculation of the export and import price indices. The export price index is weighted using the weights of the mining commodities in the export basket multiplied by the relative export Price divided by the

weights of the mining commodities in the export basket multiplied by the relative export price of the period 2010 (2010= 100). USA CPI is a proxy for the import price index.

The expected signs of the in the relationship between ToT and different variables is in table 2. It is expected that ToT have a negative relationship with the exchange rate. This stems from the fact that when there is a negative terms of trade shock, authorities should depreciate to absorb the negative shock.

Table 2: Expected Signs Positive TOT shocks

| Variables	Expected sign
REER	-/+
TO	+
RGDP	+
M2	+
TB	+

However, the literature made a distinction between fixed and flexible exchange rate regimes. Therefore, different regimes apply different policies to absorb a terms of trade shock. A separate empirical analysis for the fixed exchange rate and a separate for the flexible exchange rate will not be carried out, because the data points are limited for the period of a flexible exchange rate. Suriname adopted the flexible exchange rate in 2016. Hence, the data set contains only three data points. Therefore, time series of both regimes will be lumped together in the empirical analysis.

Figure 2 depicts the development of the commodity terms of trade and the exchange rate. The commodity terms of trade fluctuated significantly over the period under review. Boom and bust in the terms of trade seem to coincide with major global economic developments, such as the global recession in the 80's, the oil shocks in the 90's, the commodity booms in the 2000s and the global financial crisis from 2007. The rise in commodity prices especially that of Gold and

Oil, which peaked in 2008, reflects the high volatility in the commodity terms of trade around 2007. In figure 1975-994 is exclude, for analytical purposes.

The large swings in the terms of trade are also apparent in the REER. It is worth mentioning, that there is a negative relationship between terms of trade and REER (r= 0.38). This implies that a one percent point change in the terms of trade will affect the REER to change with 0.38 percent point's vis-à-vis. The commodity terms of trade index declined in 1995-1998, which resulted in depreciation of the domestic currency. During this period, the country started to accumulate foreign reserves, after a period of huge losses of reserves between 1990 until 1993. These losses were as a response of defending the nominal exchange rate, through interventions, by the authorities (annex 6).

Figure 2: Commodity Terms of trade Developments and REER: Terms of trade developments and REER
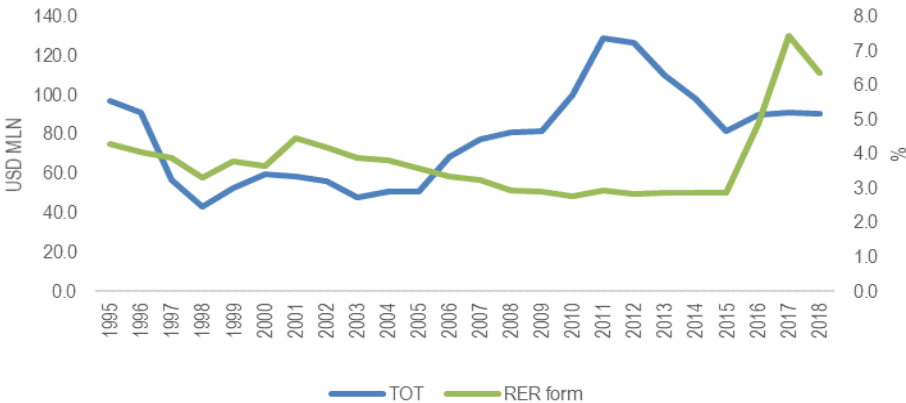
Source: Central bank of Suriname and own calculations

The upturn in terms of trade in the following periods (until the early 2000s) has reversed trends and triggered a slight appreciation of the domestic currency, though smaller than the previous depreciation. From 2001 until 2010, the REER index depreciated gradually but continuously, caused by the improvement of the terms of trade. This improvement because of the rise in commodity prices of the main export commodities. The terms of trade index improved with 22.6 % to 100 in 2010 and continued to increase in 2011. In this period (2001-2012), the

country's foreign exchange reserves grew significantly and reached a peak of US$ 1 billion in 2012. Due to an overvalued domestic currency and the necessity to ease pressure in the foreign exchange market,2 the monetary authorities decided to devaluate the nominal exchange rate from SRD 2.8 to SRD 3.35 for one US$ (US$/SRD) in 2011. Hereafter, deterioration of the terms of trade sets in which result in an appreciation of the REER index until 2017. In 2015, the monetary authorities devaluated the nominal exchange rate from 3.35 to 4.04 for a US$. In May 2016, the authorities shifted from a fixed to a flexible exchange regime. Suriname had a fixed exchange rate regime for the past decades; the swings in the terms of trade however were not fully offset and therefore result in substantial fluctuations in output. Overall, the commodity terms of trade deteriorates on average in the period under review.

4.3. Methodology

Firstly, the model estimation followed the unit roots testing and other tests. A unit root test verifies whether variables in a model are stationary. The importance of stationarity, i.e. the mean and variance are transitory and do not deviate over time, derives from the fact that the results of the variables are statistically reliable and not biased. Moreover, the result of the regression will not lead to spurious outcome and consequently will produce genuine correlations between the variables of interest. Two widely used statistical procedures are employed, namely the Augmented Dickey-Fuller (ADF) test statistic (1981) and the Phillips-Perron (PP) test statistic (1988), to trace the presence of unit root in the data and to establish the order of integration of the variables, I(0) or I(1). The null hypothesis of the ADF and PP tests state that the data series have a unit root.

The ADF and PP tests concluded that all variables are integrated of the order one (see Annex 1). For the ease of interpretation of estimated coefficients, the variables are transformed in a logarithmic form. It allows for the interpretation of the parameters as elasticities. In addition, we present the correlation and descriptive statistics of the variables (Annex 1 & 2). These tests enable to determine the order of integration for each variable and conclude whether variables

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[2] In 2004 the currency changed from the Surinamese guilder (SF) to Surinamese Dollar (SRD)

are stationary or not. All two tests affirm that all variables are integrated of order one. A co-integrated system may be represented in an error correction structure, which incorporates both changes and levels of time series such that all the elements become stationary (Engle and Granger 1987). Since the model is not explicitly specified in exogenous and endogenous terms, the degree of causality between the variables is determined in the regression model.

The second step is to determine the optimal lag length, which was found to be four lags, as suggested by the Akaike Information Criteria. Afterwards, a VAR lag exclusion Wald test is executed to check for joint significance of the variables. The result shows that all endogenous variables in the model are jointly significant at each lag length for all equations.

After estimating the VAR the residuals of the model should fulfill the assumption of no serial correlation, no heteroscedasticity, normal distribution and stability. If otherwise, the results could be spurious or misleading. Therefore, we ran the LM Tests and White Heteroscedasticity tests, which revealed that the residuals are not serially correlated and that they have a constant variance (no heteroscedasticity). The Jarque-Berra test also shows that the null-hypothesis of normal distribution is met meaning that the residuals are normally distributed. The estimated VAR procedure passed all the residual tests meaning that it is stable (Appendix 4). The execution of an impulse response function traced the effect of a one-time shock to one of the current and future values of the endogenous variables. In addition, the deployment of a VECM traced the long run coefficient. The VECM also undergoes and passes the required tests.

4.4. Results
First the unit root test results revealed stationarity of the estimated variables in the first difference, thus the variables entered the model as I (1) data. Furthermore, the optimal lag length procedure suggested that four lags were sufficient and as such selected. Thus, re-estimation of the VAR model based on four and eight lags, took place.

The results also confirm integration of the used data, tested with the Johansen co-integration test. The trace-test statistics indicate that at most four co-integrating equations existed for each equation at the level of 0.05. The existence of co-integration means that there is a long-run relationship between the variables, thus suggesting that they move together.
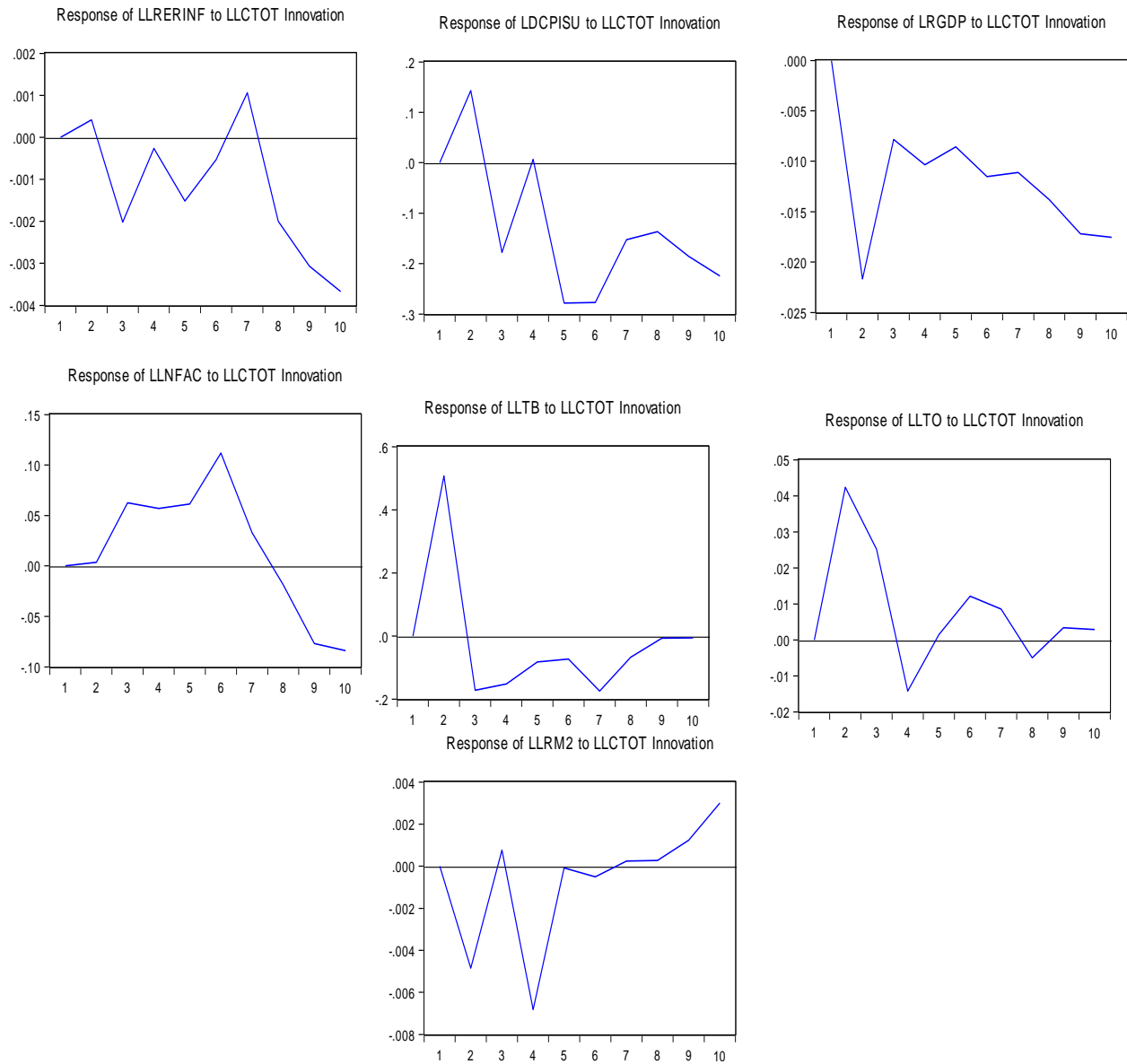
Figure three, depicts the outcome of the impulse response function of the selected variables to a one standard deviation shock to the commodity terms of trade. The response of the negative shock of CTOT revealed that REER appreciated. Negative terms of trade result in decline of foreign capital inflows increasing the pressure on exchange rate. It is worth highlighting, that Suriname is a high-dollarized economy with 65.3 percent of deposit dollarization and 47.7 percent of credit dollarization in 2018 (Annex 5). The impulse response also registered a decline in economic growth due to a fall in commodity export earnings. Suriname is a mineral dependent country relying for 90% on the mining sectors for export revenues. In addition, CPI declined which is in accordance with research done about Suriname by Kim (2016). She suggested a cumulative percentage change of 0.7 exchange rate pass-through on inflation, which is reflected in the impulse response function. Also broad money declined. As of 2018 foreign currency component comprised 60 percent of broad money (Annex 7). The phenomenon of foreign currency transactions by residents outside the banking system existed since 1983, although the foreign exchange legislation considered these transactions illegal. Yet, residents settled their foreign currency transactions in the informal/illegal circuit, because of the scarcity of foreign exchange in the banking system. In the early 1990s, the government of Suriname started a liberalization process embedded in a Structural Adjustment Program (SAP). One of the first measures commenced in June 1992, when residents were allowed to possess foreign currency and commercial banks were allowed to open foreign currency balances for residents. As of July 1995, commercial banks were permitted to provide foreign currency loans to residents.

The net foreign assets of commercials have been included in the impulse response function, because according to Adams and Barret (2018) terms of trade improvements increases countries' net foreign asset position, due to valuation effects of nominal net assets. The impulse response function suggested that in the first period the terms of trade shock does not affect the net foreign assets of commercial banks. However, according to the VAR results the impact exits from the second lag and suggested a positive relation.

When the impact of terms of trade is considered in the VAR estimation, the results suggested that a one percent rise of terms of trade increases economic growth by about 0.27 percent. The coefficient of the VAR suggested that a one percent change in CTOT changes REER with 0.20 percent in the opposite direction. Real money had a small interaction of 0.06 percent with terms of trade.

Figure 3: Impulse Response negative Shock of CTOT

Response of LLRERINF to LLCTOT Innovation

Response of LDCPISU to LLCTOT Innovation

Response of LRGDP to LLCTOT Innovation

Response of LLNFAC to LLCTOT Innovation

Response of LLTB to LLCTOT Innovation

Response of LLTO to LLCTOT Innovation

Response of LLRM2 to LLCTOT Innovation

Source: Eviews 2010

5. Conclusions and policy implications

The development of the terms of trade is a continuing and important process as it is the factor determining the income of a country. A great number of studies have analyzed the trade

balance interaction with growth and the type of exchange rate regime served as a channel in developed and developing countries with increased emphasis on developed and emerging economies. According to the literature, terms of trade shock can be absorbed depending on the country's exchange rate regime. Researchers stated that under a flexible exchange rate regime, countries have more flexibility to adjust to terms of trade shocks. Whilst, under a fixed exchange rate regime, countries have less flexibility to adjust. However, using the case of Suriname it was not possible to make a proper judgment on the performance of the flexible exchange rate regime. The country recently switched from a fixed to a flexible exchange rate system.

This paper attempted to investigate the interaction of commodity terms of trade with the exchange rate and its impact on growth under different exchange rate regime. The impulse response function suggested that negative terms of trade shock appreciates the REER, because foreign capital declined increasing exchange rate pressure. This results in a decrease of the purchasing power. In turn, inflation increases and economic growth declines. The impulse response suggested an improvement of the trade balance during negative terms of trade suggested, which is not according to theory. In de VAR estimation, a one percent rise of terms of trade increases economic growth by about 0.27 percent. The coefficient of the VAR suggested that a one percent change in CTOT changes REER with 0.20 percent in the opposite direction. Real money had a small interaction of 0.06 percent with terms of trade.

Worth mentioning is that the Surinamese authorities continuously defended the exchange rate, through interventions on the exchange rate market, in the period under review (1975-2018). Therefore, the magnitude of the terms of trade shocks on the exchange rate is small. With the above mentioned it is clear that the international reserves (IR) can be used as a buffer to absorb terms of trade shocks in developing countries under a fixed exchange rate regime. However, interventions cannot be used indefinitely to defend the exchange rate, because the IR functions as a buffer to provide confidence in the domestic currency. The central Bank should prevent a sudden capital flight for the country by using the IR. In that way, that a strong position in

foreign currency reserves can prevent economic crises caused when an event triggers a capital flight. Moreover, to meets its external obligations the country needs reserves.

Further research may include estimating the terms of trade index based on the main commodities on both import and export of mining production. Furthermore, estimation of the non -mining terms of trade, based on the non- mining exports commodities, will add to the estimation of the overall terms of trade of Suriname. This will explicitly illustrate the role of exchange rate in explaining the dynamics effects of terms of trade shocks in Suriname. This against the background of changing of exchange rate regime.

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Annex

Annex 1: Descriptive statistics

	TOT	CPI	M2	REER	TB	DTO	RGDP
Mean	-0.010795	3.163912	446.4178	0.092351	12.41122	0.060341	6579.163
Median	-0.019765	0.512399	45.5136	-0.035713	15.2	-4.59814	5576.031
Maximum	0.50996	22.00252	5553.725	8.639474	675.1	287.2729	10201.81
Minimum	-0.377132	-28.22366	0.0512	-3.889365	-508.8809	-156.147	4756.547
Std. Dev.	0.182236	7.172311	918.5486	1.620973	219.719	52.6226	1876.8
Skewness	0.420385	-1.247455	4.21011	3.257244	0.660299	3.258422	0.847083
Kurtosis	3.587273	10.71555	23.46717	19.95303	5.22625	23.55975	2.053382
Jarque-Bera	1.884447	117.8097	877.5676	590.9703	12.00447	833.4341	6.747921
Probability	0.38976	0	0	0	0.002473	0	0.034254
Sum	-0.464172	136.0482	19195.96	3.97109	533.6823	2.594651	282904
Sum Sq. Dev.	1.394823	2160.566	35436721	110.3572	2027611	116303.8	1.48E+08
Observations	43	43	43	43	43	43	43

Annex 2: Correlation matrix

	TOT	CPI	M2	REER	TB	DTO	RGDP
TOT	1	0.213631	0.178004	-0.15208	0.434383	-0.02031	0.173443
CPI	0.213631	1	0.118818	-0.27922	-0.17557	-0.05261	0.235822
M2	0.178004	0.118818	1	0.180646	0.315323	0.040098	0.636168
REER	-0.15208	0.27922	0.180646	1	0.100661	0.290183	0.036231
TB	0.434383	0.175573	0.315323	0.100661	1	0.112239	0.004252
DTO	-0.02031	0.052613	0.040098	0.290183	0.112239	1	0.009911
RGDP	0.173443	0.235822	0.636168	0.036231	0.004252	0.009911	1

Annex 3: Unrestricted Cointegration Rank Test (Trace)

Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.91	248.68	125.62	0.000
At most 1 *	0.71	152.00	95.75	0.000
At most 2 *	0.66	102.98	69.82	0.000
At most 3 *	0.59	59.73	47.86	0.003
At most 4	0.25	23.71	29.80	0.213
At most 5	0.15	12.04	15.49	0.155
At most 6 *	0.13	5.37	3.84	0.021

Trace test indicates 4 cointegrating eqn(s) at the 0.05 level
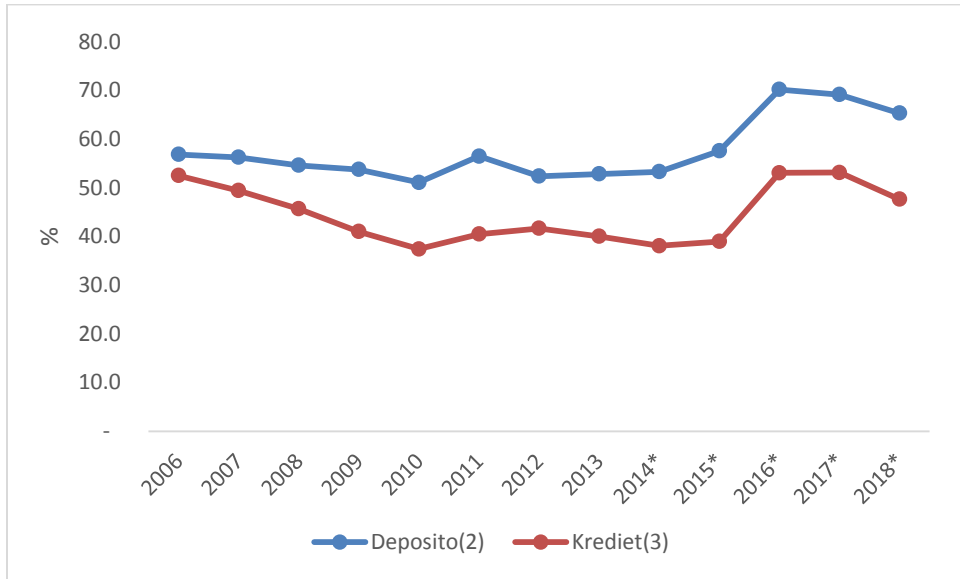
* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Annex 4: Residual Test

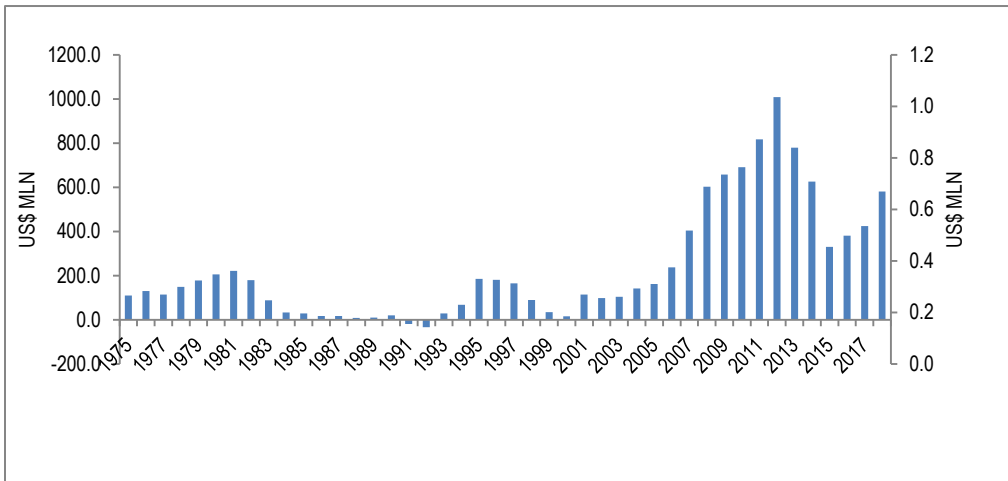|	P-value
Normality	0.35
Serial Correlation	0.69
Heteroskedasticity	0.23

Source: Eviews 10

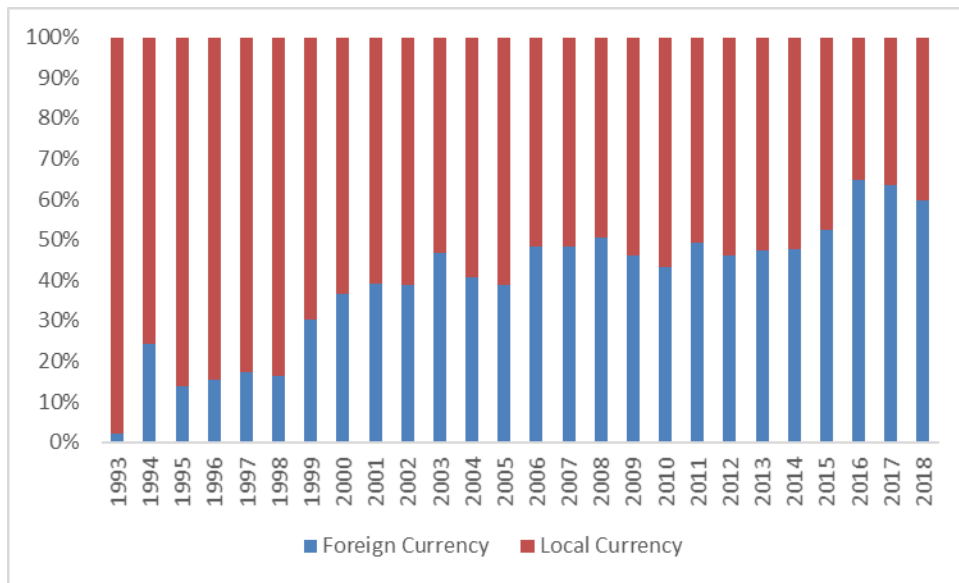## Annex 5: Deposit & Credit Dollarization

Source: Central bank of Suriname and own calculations

Annex 6: International Reserve development

Source: Central Bank of Suriname and own calculations

Annex 7: Deposit & Credit Dollarization

Source: Central Bank of Suriname