Short-Run and Long-Run Relationship between Money and Prices: The Case of Suriname

Sanjay Gaurisankar

Email: sgaurisankar@cbvs.sr

with

Saira Jahangir-Abdoelrahman

Karel Eckhorst

Wendy Amatali-Sisal

Rosminie Warsosemito

Daniëlla Wondel

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ABSTRACT

This study examines the short-run and long-run dynamics in the relationship between money and prices in Suriname using the annual data set from 1980 to 2010. In particular, the direction of causality between these macroeconomic variables is investigated. Granger Causality is a well-established technique for this purpose and is thus employed in this study. The results suggest a unidirectional causality from prices to money in the long run, while a bi-directional causality exists in the short-run.

C O N T E N T S

1. Introduction

A recurring theme in monetary policy circles is the question whether money growth is driven by inflation or whether inflation is driven by money growth. This relationship has been extensively investigated in previous studies and yet the debate is unsettled regarding the direction of causality, in the short-run as well as in the long-run. In the monetarist view, an increase in the money supply, may lead to an increase in output in the short run, but in the long run this influences only prices (Sharma, Kumar & Hatekar, 2010). Conversely, the Keynesians implicitly argue that factor prices plus a mark-up drive inflation, which precedes money stock changes. The Keynesians state that monetary expansion determined by the demand for money rather than the discretionary powers of the monetary authorities over the money supply, will only be reflected in prices if and only if full employment is attained (Saatçioğlu & Korap, 2005).

Suriname has had a volatile inflation history as a result of fiscal dominance over monetary policy in the 1980s and the 1990s. In 1992, the authorities embarked on a structural reform programme to stabilize the economy. This programme included a massive devaluation of the domestic currency, which skyrocketed inflation into the triple digits. Stringent monetary policy and fiscal restraint stabilized the economy in the mid 1990s, but lax fiscal policy destabilized the economy once again in the late 1990s.

The general notion has long existed that Suriname has experienced episodes where money drove prices and vice versa. However, theoretical arguments and hypotheses regarding money supply and price behaviour require empirical investigation in which causality can be determined. Granger Causality (Granger, 1969) is a well-established technique for this purpose and is thus employed in this study. The empirical evidence of Suriname contributes to the existing literature on this topic.

This paper aims to study the directional causality between money and prices in Suriname over the period 1980-2010. The remainder of the paper is structured as follows. Section 2 elaborates on key institutional changes in the fiscal and exchange rate area and gives an overview of Suriname's inflation experience. Section 3 briefly reviews the existing literature on money and price causality. Section 4 investigates the statistical properties of the time series used in this study. Section 5 provides the model specification, outlines the methodology and presents the results of the estimated model. Section 6 concludes the paper and points out the policy implications.

2. Institutional changes and inflation experience in Suriname

2.1 Main institutional changes

During the period 1980-2010 the Surinamese economy went through several institutional changes in the area of exchange rate and fiscal policy. Most of the institutional changes were embedded in a Structural Adjustment Programme (SAP) that was passed by the legislative body, The National Assembly, in November 1992. The SAP was aimed at stabilizing and reforming the economy after a prolonged period of economic instability, mainly reflected in monetization of fiscal deficits, excess liquidity, exchange rate and inflationary pressures and stagnant economic growth. Table 1 provides some indication of the macroeconomic environment since the 1980s.

Table1:
Selected macroeconomic indicators
(period averages)

Indicator	1980s	1990s	2000s
Real GDP growth (%)	-1.0	0.7	4.5
Average inflation (%)	12.8	96.3	18.8
M1 growth (%)	23.7	65.5	30.7
Fiscal balance (% of GDP)	-17.7	-5.2	-0.6
Import cover ratio (months)	1.7	1.8	2.9

Sources: General Bureau of Statistics, Central Bank of Suriname and Ministry of Finance

The institutional measures in the SAP included, among others, change of exchange rate regime and reform of the tax system. Other measures included government spending cuts, domestic debt restructuring and open market type monetary operations. The SAP was implemented in the first half of the 1990s.

In the second half of the 1990s the Surinamese economy suffered some setbacks in fiscal and monetary management, resulting in an unstable macroeconomic environment with exchange rate pressures, increasing inflation and growth of government debt. In the first half of the 2000s the government revert to economic stabilization measures. Initially, the exchange rate for the U.S. dollar was increased and tax increases were implemented to deal with fiscal imbalances. In order to

guarantee sound fiscal and monetary management in the future the government adopted formal fiscal rules on government borrowing and amended the Central Bank Act. The fiscal rules comprises debt ceilings on government debt, while the amendment of the Bank Act imposed, among other things, well-defined restrictions on central bank financing of fiscal deficits. Both legislative products prescribe severe penalties for the monetary authorities if the rules were to be violated. The stabilization measures also included a monetary reform in 2004, whereby the denomination structure of the currency was decimalized by one thousand for convenience and efficiency purposes.

The institutional measures describe the main changes in fiscal and monetary management during the period under consideration. These changes influenced the development of money and prices in the economy directly or indirectly.

2.2 Inflation experience

Suriname maintained a fixed peg to the U.S. dollar since 1971 till mid-1994, namely Sf 1.80 per U.S. dollar. The overvaluation of the exchange rate began in the 1980s as large declines of world market prices for bauxite derivatives, at that time Suriname's most important export commodities, caused government revenues to drop (Fritz-Krockow, et al., 2009). Additionally, the revenues were negatively affected by the suspension of Dutch development aid in 1983 and the armed rebellion in the interior in the late 1980s. As a result, fiscal deficits were primarily financed by the Central Bank. The international reserves dwindled, money supply grew sharply and a vivid parallel market in foreign currency developed. Appendix 2 presents the development of the exchange rate in the official and parallel markets.

In the first half of the 1990s the government implemented a Structural Adjustment Programme to stabilize the economy. One important measure was the gradual liberalization of the exchange rate regime. Initially, the government established a multiple exchange rate regime with several fixed exchange rates to the U.S. dollar. In June 1993, a floating free market exchange rate was introduced at Sf 43 per U.S. dollar. In July 1994, the fixed rates were abandoned and the exchange rate to the U.S. dollar was unified at Sf 190. Officially, a managed-floating exchange rate was established. However, the gap with the parallel market rate still persisted.

The first bout of high inflation in the early 1990s, referred to as an episode of near-hyperinflation (Fritz-Krockow, et al., 2009), directly followed from the sharp devaluation of the currency in 1994. At the same time, the Central Bank was engaged in gold purchase activities with the aim to accumulate the gold reserves and to regulate the gold mining in the country. In addition, the Central Bank incurred massive losses during the multiple exchange rate regime between late 1992 and mid-1994, since its average buying exchange rate was much higher than its average selling rate (Ibid, 2009). Money supply (M1) grew at an annual average rate of 66% between 1991 and 2000. Much of the money growth was concentrated in 1993, 1994 and 1995, at respectively 88%, 246%, and 176%.

In March 1995, the Central Bank issued gold certificates to absorb excess liquidity. In mid-May 1995 the Central Bank intervened in the foreign exchange market and halted the currency depreciation. Growing export revenues facilitated the accumulation of international reserves and enabled the Bank to intervene in the foreign exchange market. Under the influence of fiscal reforms, liquidity measures, growth of exports and foreign exchange interventions resulting in stable exchange rates, Suriname witnessed deflation in 1996.

Towards the end of the 1990's once again Suriname faced expansionary fiscal policies and reduced foreign inflows caused by declining export prices and reduced Dutch grants (Fritz-Krockow, et al., 2009). Consequently, the country was confronted with a second episode of high inflation. Inflation accelerated on average in 1999 (98.8%) and in 2000 (59.3%). Money supply (M1) grew at an annual average rate of 72% between 1998 and 2000. Inflationary pressures and a growing spread between the official and parallel market rate, culminated in a large devaluation of 84% in early 1999. However, instability in the foreign exchange market persisted.

In August 2000 the authorities conducted strict monetary and fiscal measures to restore macroeconomic stability. They devalued the Surinamese guilder by almost 90%, stopped excessive central bank lending to the government and gradually relied on treasury bills as a source of financing, removed subsidies and raised tariffs on petroleum products and utilities. As a result, the economy stabilized in 2001. However, in 2002 the government granted the civil servants a large wage increase causing the fiscal accounts to deteriorate. The government relied heavily on the

Central Bank to meet its financing need. As a consequence, market expectations were negatively influenced causing volatility to return on the foreign exchange market.

In late 2002, the authorities tightened fiscal and monetary policies and ultimately stabilized the economy. In addition, the authorities strengthened fiscal discipline by adopting the State Debt Act in March 2002. The act influences the direction of fiscal policy since it initially required the government to stick to a ceiling of 15% of GDP for domestic debt and a 45% of GDP for foreign debt. In 2011, the ceilings were adjusted to 25% and 35% respectively. After these stabilization efforts, the Central Bank replaced the Surinamese guilder (Sf) by the Suriname dollar (SRD) at a rate of Sf 1.000 per SRD on 1 January 2004. Since then, the exchange rate was fairly stable till 2008. The de facto peg to the U.S. dollar played an important role in containing inflationary pressures during this period.

During 2009-2010, however, the official exchange rate came under increased pressure following the decline of foreign exchange revenues and the deterioration of the fiscal accounts. The former resulted from the effects of the 2007/2008 international financial crisis on the prices of export commodities. The latter was caused by increased election-related expenditures and a substantial wage increase for civil servants during the course of 2009/2010. In addition, political uncertainty surrounding the general elections of May 2010 as well as speculative attacks compromised the value of the currency. Ultimately, the official exchange rate of the U.S. dollar was adjusted from SRD 2.78 to SRD 3.35 in January 2011.

The qualitative analysis of inflation during 1990-2010 reveals two important lessons for Suriname. Firstly, high inflation episodes mostly coincide with expansionary fiscal and accommodating monetary policies and reduced foreign inflows ultimately resulting in devaluation/depreciation of the currency. Secondly, a prudent fiscal and monetary policy stance in conjunction with increased foreign inflows attribute to macroeconomic stability.

3. Literature review

The theoretical debates on the causality between money and prices are basically concentrated alongside the opposing views of the monetarists and the Keynesians. The foundation of these debates lies in the theories explaining the demand-pull and cost-push factors affecting inflation (Greenidge & DaCosta, 2008). Other approaches on inflation elaborate on other factors, such as expectation-based price stickiness (Saatçioğlu et al., 2005) and structural government policies (Greenidge et al., 2008), but do not explicitly refer to money supply changes. The demand-pull factors theory implies a unidirectional causality running from money to prices in the long run. The cost-push theory focuses primarily on the factor costs in the production process, such as mark-up of firms and increases in wages, prices of raw materials and cost of capital, as determinants of inflation. Although the cost-push theory does not explicitly mention that inflation precedes money stock changes, one can derive this causal inference.

Several empirical studies have been conducted on the causal relationship between money and prices using the Granger Causality test. The outcome varied from unidirectional to bidirectional Granger causality between money and prices. Table 2 provides the results of some empirical studies on this topic.

Table 2:
Some empirical evidence of Granger causality between money and prices

Reference	Period	Frequency of data	Country	Results
Alston & Chalfant, 1987	1972-1983	Annual	Australia	Unidirectional causality from money to both wages and prices
Jones, 1989	1959-1980	Quarterly	USA	Bidirectional causality
Baldé & Rodriguez, 2005	1980-1997	Monthly	Peru	Bidirectional causality
Husain & Rashid, 2009	1959-2004	Annual	Pakistan	Unidirectional causality from money to prices in the long run Unidirectional causality from prices to money with two years lag in the short run

Source: Authors

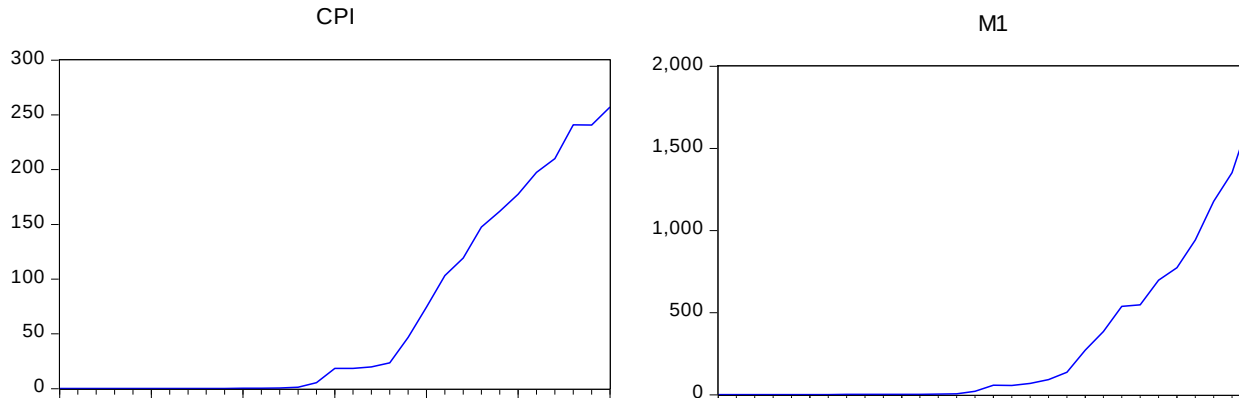
The theoretical underpinnings as well as the empirical evidence of the direction of causality between money and prices remain inconclusive.

4. Data Analysis

The aim of the paper, as it is mentioned in the introduction, is to determine causality between prices and money in Suriname in the short and long run. Before a causality test is applied, the money and price variable are put to some descriptive analysis. Specifically, the average consumer price index (CPI) from the General Bureau of Statistics and money (M1) from the Central Bank of Suriname are analyzed using annual data over the period 1980 to 2010. The nominal values of the time series are presented in Appendix 1. The data analysis consists of graph displays, trend analysis, description of summary statistics and unit root tests. The trend analysis is done using Hodrick-Prescott (HP) filter. To determine whether unit root exits in the series the following tests are applied:

- Augmented Dickey-Fuller (ADF) test.
- Kwiatkowski, Phillips, Schmidt and Shin (KPSS) test.

Figure 1



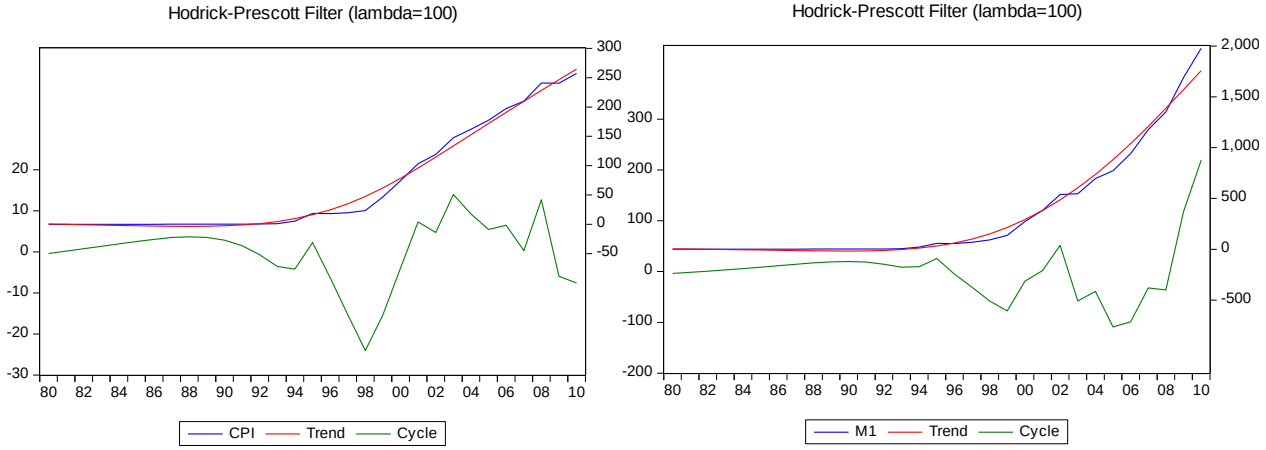
Source: General Bureau of Statistics

Source: Central Bank of Suriname

The graphs of CPI and M1 both show an upward slope during the sample period in Figure 1. This suggests non-stationary series, which implies that the mean and the variance of the series are increasing over time. Such a development is common for nominal macroeconomic variables. Yet, the visual observation must be substantiated with unit root tests.

Figure 2.

HP filter for CPI and M1



Sources: Authors using Eviews 7.0

The Hodrick-Prescott (HP) filter has been applied to the graphs in order to extract the trend from the time series. This gives a smoothed non-linear representation, one that is more sensitive to long term than to short term fluctuations. The graphs in Figure 2 show that the trend lines move quite parallel with CPI and M1. The cyclical or short term movements are far more volatile.

Table 3:
Summary statistics
(sample: 1980-2010)

	Mean	St.dev	Skewness	Kurtosis	Jarque-Bera	Probability
CPI	66.658	89.666	0.980	2.377	5.468	0.065
M1	348.618	548.659	1.628	4.625	17.100	0.000

Source: Author using Eviews 7.0

Table 3 provides additional information on the series. The average CPI is about 67, while the spread in the series is approximately 90. The spread in the M1 series deviates more from its mean. One of the assumptions for running a regression is that the series should be distributed normally. This implies that on the one hand skewness, a measure of asymmetry of the distribution, should be zero. On the other hand, kurtosis, measure for peakedness of the distribution of the series, should be 3. To be certain if the series comply with the standards of a normal distribution, hypothesis testing can be applied using the Jarque-Bera test statistic. This test statistic measures the difference

of skewness and kurtosis of the series with those from a normal distribution. The null hypothesis states the series are normally distributed. Since the probability or p-value is greater than 0.05, the null hypothesis cannot be rejected for CPI. This implies that the CPI is normally distributed. For M1, however, the null hypothesis of normality is rejected.

The stationary properties of the series can be determined by testing for unit root. Stationary and non-stationary series are symbolized with I(0) and I(1) respectively. The null hypothesis of the ADF test state that the series have a unit root, while the KPSS test specifies the null hypothesis as a stationary property. The ADF and KPSS test statistic of the series are presented in Table 4.

For the levels of CPI and M1 the results show, based on p-value of the ADF test, that the null hypothesis of unit root cannot be rejected meaning the series are non-stationary. Although the KPSS test states that both series are stationary at 1% level, it also confirms that the series are non-stationary at 10% and 5%. Based on these results, the assumption that CPI and M1 are non-stationary in levels is valid.

The first difference of CPI is, according to the p-value of the ADF and PP test, non-stationary. The KPSS test also shows these series are non-stationary at 10% and 5%. However, the results of this test indicate stationary series at 1%. Yet, it is reasonable to assume that the first difference of CPI is non-stationary. The p-value of the ADF test implies that the first difference of M1 is non-stationary. The KPSS test reveals non-stationary series at 5% and 10%. Accordingly, the first difference of CPI and M1 are non-stationary.

Since CPI and M1 are non-stationary in their level and first difference, the stationary properties of their logarithmic values in level are also investigated. The results of the ADF test show that LCPI as well as LM1 are non-stationary. Additionally, the KPSS test indicates non-stationary series at 5% and 10%. Both tests reveal that the series are stationary in their first difference at all levels.

Table 4:
ADF and KPSS test statistic of CPI and M1

Variable	ADF	KPSS
CPI	3.558	0.615***
	(1.000)	
M1	11.124	0.585***
	(1.000)	
∆CPI	-1.502	0.532***
	(0.518)	
ΔM1	2.888	0.611***
	(1,000)	
LCPI	-0.687	0.691***
	(0.834)	
LM1	-0.652	0.715***
	(0.844)	
∆LCPI	-3.494	0.177
	(0.016)	
∆LM1	-3.187	0.113
	(0.031)	

Source: Authors using Eviews 7.0

Notes:
Probability values are in parenthesis.
* Indicates series are stationary at 10% level.
** Indicates series are stationary at 5% level.
*** Indicates series are stationary at 1% level.

5. Model specification, methodology and results

5.1 Model specification

The purpose of the study is to determine the long run and short run direction of causality between money and prices in Suriname. The theoretical underpinnings imply bidirectional causality while empirical studies provide a model in a vector autoregression (VAR) framework to investigate the relationship (see e.g. Saatçioğlu et al., 2005; Jones, 1989; Gilman & Nakov 2004). The advantage of bivariate VAR models over single equation models lies in the ability to analyze the temporal ordering of endogenous time series and their dynamic response to a shock in the system (Jones, 1989). In this regard impulse response analysis, variance decomposition and Granger causality tests can be applied to receive important information about the interaction among, the proportion of movements in and the exogeneity of the variables respectively.

Granger causality in a VAR model assumes that the time series are stationary in levels. If the time series are non-stationary in levels but integrated of the order one in their first difference, a dynamic VAR, also called a vector error correction model (VECM), is applied. The reasoning of Engle and Granger (1987) in this regard is that a linear combination of at least two I(1) variables may be stationary and thus may be considered as co-integrated variables. This means a long run equilibrium relationship exists between the variables. A VECM permits specifying the time series in terms of long run relationships and deviations from the long run equilibrium in the short run.

If the variables are co-integrated, a VECM can be applied to determine the long run relationships and the short run dynamics. The general form of the VECM can be formulated as follows:

$$(1) \quad \Delta y_t = \gamma_y (y_{t-1} - a_0 - a_1 x_{t-1}) + \sum_{j=1}^{r} \alpha_j \Delta y_{t-j} + \sum_{j=1}^{r} \beta \Delta x_{t-j} + u_t$$

$$(2) \quad \Delta x_t = \gamma_x (y_{t-1} - a_0 - a_1 x_{t-1}) + \sum_{j=1}^{r} \delta_j \Delta y_{t-j} + \sum_{j=1}^{r} \theta \Delta x_{t-j} + v_t$$

Δyt and Δxt are the endogenous time series with u_t en v_t as the respective error terms. The long run equilibrium relationship in the system is presented by the error correction term [ECT] $\left(y_{t-1} - a_0 - a_1 x_{t-1}\right)$.

The parameters of the ECT (γ_y and γ_x) represent the speed of adjustment in case of deviations from the long run equilibrium relationship. The lagged values of Δyt and Δxt and their parameters represent the short term dynamics in the system. The interpretation of Granger causality in terms of short term dynamics and deviations from the long run equilibrium relationship requires the parameters of the ECT to be negative and statistically significant (Butts, 2009). These conditions ensure the stability in the system, while a positive sign suggests the opposite.

5.2 Methodology and results

Based on the results of the stationary tests, the logarithmic form of money (M1) and prices (CPI) are I(1) variables, which are employed in the Granger causality analysis. First, an unrestricted VAR was calculated to determine the optimal lag length to be included in the model. In this regard the Akaike, Schwarz and Hannan-Quin information criterion indicated two lags. Second, the Johansen co-integration rank test (1988) is employed to examine the long run relationships between the log of M1 and CPI. The results of the Johansen test for co-integration and the properties of this vector are reported in table 5.

Table 5: Johansen Co-integration Test

Rank	Eigenvalue	Trace statistic	5% critical value	P-value
$r = 0$	0.479	20.961	20.262	0.040
$r \leq 1$	0.091	2.725	9.165	0.633
Rank	**Eigenvalue**	**Max. Eigen statistic**	**5% critical value**	**P-value**
$r = 0$	0.479	18.236	15.892	0.021
$r \leq 1$	0.091	2.725	9.165	0.633

Source: Authors using Eviews 7.0

According to the trace statistics, there is one co-integrating vector with the rank *r*. The results after testing the null-hypothesis of no co-integration ($r = 0$) show that the trace statistic clearly exceeds the critical value, which implies that the null-hypothesis can be rejected and the alternative hypothesis of $r = 1$ is accepted. The maximum eigenvalue test indicates a similar outcome. These results suggest that one co-integrating equation exists for LM1 and LCPI and allow for the estimation of a VECM. For this purpose the Seemingly Unrelated Regression method is employed.

The results for the VECM are as follows:

$$(1)\quad \Delta(\mathrm{LM1})_t = \underset{(-5.204)}{-0.242} * (\, LM1_{t-1} - \, 0.935 * LCPI_{t-1} - \, 2.980\,) - \underset{(-3.542)}{0.532} * \Delta(LM1_{t-2}) + \underset{(5.180)}{0.579} * \Delta(LCPI_{t-1})$$

$$(2)\quad \Delta(LCPI_t) = \underset{(-2.986)}{-0.191} * (\, LM1_{t-1} - \, 0.935 * LCPI_{t-1} - \, 2.980\,) - \underset{(-3.019)}{0.625} * \, \Delta(LM1_{t-2} + \underset{(5.185)}{0.800} * \Delta(LCPI_{t-1})$$

The t-statistics of the parameters are shown in parentheses. The long run co-integrating equation ($LM1_{t-1}$= $0.935 * LCPI_{t-1}$+ 2.980) indicates a unidirectional Granger causality from prices to money in Suriname. This outcome is contrary to the monetarist view and the empirical evidence from other countries which state that the long run (Granger) causality runs from money to prices. A plausible explanation may be the occurrence of several episodes of currency depreciations and consequently the wage-price spiral during the sample period, in particular the 1980s and 1990s. The long run impact may stem from the sequence of falling foreign exchange revenues or distortions in foreign inflows to exchange rate pressures with pass-through to inflation and consequently money demand changes, and not necessarily from the generally accepted reasoning of central bank financing of fiscal deficits to price changes. At least, not in the long run in the case of Suriname.

The speed of adjustment of the co-integrating vector in both equations is negative and statistically significant. So in the short run, both money and prices may deviate from the long term equilibrium in response to shocks in the system, which implies bidirectional Granger causality. Evidently, the parameters of the ECT indicate that in response of a shock in the system money growth and inflation decline in order to correct 24% and 19% respectively of the deviation from long run equilibrium each year. A money or price shock would last roughly four and five years respectively before both variables adjust to their long run equilibrium.

The significance of the short-run dynamics is verified by conducting a Wald test. The results are presented in Table 6. The p-value confirms that the null-hypothesis of two-lagged ΔLCPI and one-lagged ΔLM1 is insignificant in both equations and can thus be rejected.

Table 6:
Wald Test

Coefficients		Value	Std. Err.
C(3)		-0.532	0.150
C(4)		0.579	0.111
C(8)		-0.625	0.207
C(9)		0.800	0.154
Test Statistic	Value	df	p-value
Chi-square	29.298	2	0.0000

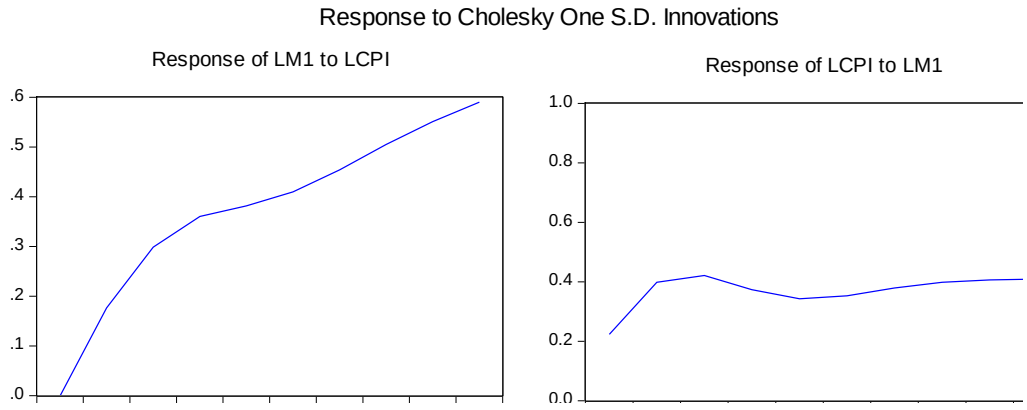
Source: Authors with Eviews 7.0

The dynamics of the models can be illustrated by using impulse response functions of the VAR system. In this regard the Cholesky decomposition method is employed to identify the duration and intensity/direction of the shocks. The impulse responses are illustrated in Figure 3. The first graph shows the response of money to a single one-standard-deviation shock in inflation, while the second graph plots the opposite. The x-axis expresses the duration of the shock in years, while the y-axis presents the intensity/direction of the impulse.

The positive response of money to a price shock, as presented in the first graph, seems to last four years. The second graph reveals a negative response of inflation to a money shock which disappears in about five years.

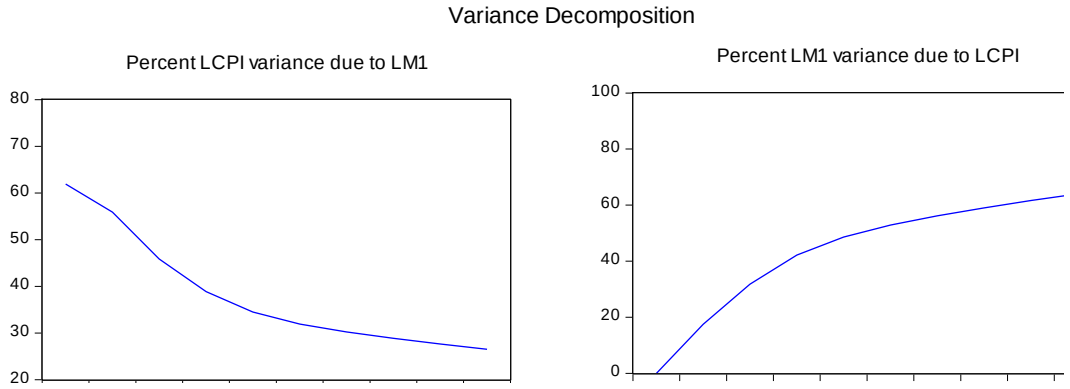
Figure 3

Impulse response



Variance decomposition is another method to analyze the dynamics of the model and illustrates the relative importance of a shock in the system. This is presented in Figure 4. The first graph reveals that a money shock accounts for 25-60% of the variation in prices, while the second graph illustrates that a price shock contributes up to 60% of the variation in money.

Figure 4



Overall, the Granger Causality analysis for Suriname suggests a unidirectional causality which runs from prices to money in the long run, while in the short run strong evidence exists of feedback between money and prices.

6. Conclusion and policy implication

In this paper the long run and short run direction of causality between money and prices is investigated for Suriname. Annual data of narrow money (M1) and consumer price index (CPI) for the period 1980-2010 have been employed in this study. A bivariate dynamic vector autoregression model enabled us to use Granger Causality analysis to examine the long run relationship, the short run dynamics and the direction of causality between M1 and CPI.

Empirical evidence suggests the existence of a long run equilibrium relationship running from prices to money rather than the conventional path from money to prices. The latter, in particular, is being argued by the monetarists and has been the outcome of some empirical studies in other countries. The opposite finding in the case of Suriname can possibly be attributed to the occurrence of several episodes of currency depreciation and wage-price spiral incidence during the 1980s and 1990s, which preceded money demand changes. In the short run, however, strong evidence of bidirectional Granger causality between money and prices exists.

The time dimension of the dynamic relationship between money and prices is of interest for policy implementation. A money shock as a result of expansionary monetary policy for example may, in the short run, lead to money demand changes causing prices to deviate from their long run equilibrium. Empirical evidence in the case of Suriname reveals that it took a money shock up to four years to adjust to its long run equilibrium during 1980-2010. Additionally, a price shock caused by currency depreciation in the same period lasted up to five years to return to its long run equilibrium. Authorities should therefore best adhere to sound policies in order to prevent large swings in money and prices. For small open economies prudence in spending policies is required, especially when foreign currency inflows decline.

References

Alston, J. M. & Chalfant, J. A. (1987). A note on causality between money, wages and prices in Australia. *Economic Record, 63* (181), 115-119.

Baldé, T. A. & Rodríguez, G. (2005). Finite sample effects of additive outliers on the Granger-causality test with an application to money growth and inflation in Peru. *Applied Economic Letters 12*, 841-844.

Butts, H. C. (2009). Short term external debt and economic growth – Granger causality: Evidence from Latin America and the Caribbean. *Rev Black Polit Econ 3*, 93-111.

Engle, R. F. & Granger, C. W. J. (1987). Co-integration and error correction representation, estimation and testing. *Econometrica 35* (2), 251-276.

Fritz-Krockow, B. El-Masry, G., Nozaki, M., Roy, T., Portillo, R., Torres, M. & Dyczewski, P. (2009). Suriname - Towards Stability and Growth (Publication Western Hemisphere Department, International Monetary Fund).

Gillman, M. & Nakov, A. (2004). Granger causality of the inflation-growth mirror in accession countries. *Economics of Transition, 12* (4), 653-681.

Granger, C.W.J. (1969). Investigating causal relations by econometric methods and cross-spectral Methods. *Econometrica 37*, 424-438.

Greenidge, K. & DaCosta D. (2009). Determinants of inflation in selected Caribbean countries. *Business, Finance & Economics in Emerging Economies, 63* (2), 371-397.

Husain, F. & Rashid, A. (2009). Price Hikes, economic reforms and causality in money, income and prices: Evidence from Pakistan. *The Pakistan Development Review 48* (2), 155-168.

Johansen, S. (1988). Statistical analysis of co-integrating vectors. *Journal of Economic Dynamics And Control 12*, 231-254.

Jones, J. D. (1989). A comparison of lag-length selection techniques in tests of Granger causality between money growth and inflation: Evidence for the US, 1959-86. *Applied Economics 21*, 809-822

Saatçioğlu, C. & Korap, H. L. (2005). *An empirical analysis of Turkish inflation (1988-2004): Some non-monetarist estimations* (University Library of Munich MPRA Paper No. 19630).

Sharma, A., Kumar, A. & Hatekar N. (2010). *Causality between prices, output and money in India: An empirical investigation in the frequency domain* (University of Mumbai, Center for Computational Social Sciences Discussion Paper No. 3).

Appendix 1
Consumer Price Index (CPI) and Money (M1)

Year	CPI (Oct-Dec 2000=100)	M1 (mln SRD)
1980	0.1	0.3
1981	0.1	0.4
1982	0.1	0.4
1983	0.1	0.5
1984	0.1	0.6
1985	0.1	0.9
1986	0.1	1.2
1987	0.2	1.6
1988	0.2	1.9
1989	0.2	2.2
1990	0.3	2.3
1991	0.3	2.9
1992	0.5	3.2
1993	1.2	6.0
1994	5.5	20.9
1995	18.6	57.7
1996	18.4	56.1
1997	19.8	69.2
1998	23.5	92.3
1999	46.8	136.7
2000	74.5	272.3
2001	103.3	384.2
2002	119.3	538.4
2003	147.6	547.1
2004	162.0	697.5
2005	177.4	772.9
2006	197.4	941.3
2007	210.0	1,177.9
2008	240.9	1,351.8
2009	240.6	1,689.5
2010	257.2	1,977.2

Sources: General Bureau of Statistics and
Central Bank of Suriname

Appendix 2
Difference central bank and parallel market rate

Year	Avg. central bank rate (Sf/SRD* per US$)	Avg. Parallel market rate (Sf/SRD* per US$)	Difference (%)
1983	1.77	2.94	66.1
1984	1.77	4.82	172.3
1985	1.77	6.64	275.1
1986	1.77	9.80	453.7
1987	1.77	16.24	817.5
1988	1.77	10.77	508.5
1989	1.77	12.82	624.3
1990	1.77	16.84	851.4
1991	1.77	18.00	916.9
1992	1.77	24.04	1,258.2
1993	70.29	62.25	-11.4
1994	204.59	235.17	14.9
1995	450.56	493.42	9.5
1996	406.26	414.38	2.0
1997	406.00	435.29	7.2
1998	406.00	555.58	36.8
1999	866.80	1,250.99	44.3
2000	1,339.20	1,941.59	45.0
2001	2,200.00	2,243.08	2.0
2002	2,349.98	2,640.45	12.4
2003	2,628.33	2,798.37	6.5
2004*	2.77	2.75	-0.6
2005*	2.77	2.79	0.7
2006*	2.78	2.80	0.6
2007*	2.78	2.80	0.7
2008*	2.78	2.84	2.2
2009*	2.78	2.94	5.9
2010*	2.78	3.36	20.8

Source: Central Bank of Suriname