Money-Based Indicators of Price Stability in Jamaica

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"**Inflation** is always and everywhere a **monetary phenomenon**"

(Friedman, 1963)

Motivation

- The BOJ is exploring transitioning to a formal inflation targeting monetary policy regime.

- The main objective of this paper is to compare the performance of the standard 'simple-sum' monetary aggregates (SSMA) with their corresponding Divisia monetary aggregate (DMA) in order to provide money-based leading indicators of inflation in Jamaica.

Outline

- Introduction
- Theoretical and Empirical Background
- The SSMA
- The DMA
  - Country Experiences
- Data and Methodology
- Results
- Conclusion

Introduction

- The long-run association between money growth and inflation has long been an area of interest in macroeconomics.

- It is argued that the co-movement between money growth and inflation may provide important and timely warning signals about the risks to price stability in the economy.

Introduction

- ECB's two-pillar framework for the assessment of future price developments and risks to price stability.

  - analysis of the real economy
  - developments in monetary indicators

- The ECB's policy framework implies that developments in the price level over the medium to long-term are monetary phenomena.

Introduction

- The analysis of the properties of monetary indicators in Jamaica has so far focused on SSMAs, as to date there has been no study on the properties of a DMA in Jamaica.

- The inclusion of money growth in the inflation analysis adds to the information available for policy makers and is seen as an additional way to predict inflation and growth trends over longer time horizons.

Theoretical and Empirical Background

Jaeger (2003)

- Uses frequency domain analysis to establish link between inflation and nominal money growth
- Highlights that this relationship is stronger at the lower frequencies but not as evident for frequencies associated with business cycle fluctuations.

Neumann & Greiber (2004)

- Studied the importance of money for inflation in the Euro Area and found that there is a close link between inflation and core money growth
- In LR, there exists a one-to-one relationship, while higher frequency money growth has a nil impact on price movements.

Theoretical and Empirical Background

Gerlach (2004)

- Filtered inflation and adjusted money growth exhibits a stronger correlation than a growth series for money that is unadjusted.
- Concluded that there is a tight relationship between money growth and inflation in the Euro Area and argues that the two-pillar approach taken by the ECB is warranted.

Amisano & Fagan (2010)

- The LR relationship between money growth and inflation typically evident through the use of smoothed measures
  - moving averages
  - frequency domain techniques.
- A much stronger coherence at the lower, relative to the business cycle frequencies, suggests that the long run link between inflation and nominal money growth is quite strong.

The Simple-Sum Monetary Aggregate (SSMA)

- Most central banks compile monetary data using simple-sum monetary aggregation, in which all monetary components are assigned the same weight as follows:

$$M_t = \sum_{j=1}^{n} x_{jt}$$

Where x_{jt} is one of the n monetary components of the monetary aggregate M_t.

The Simple-Sum Monetary Aggregate (SSMA)

For example, in the case of Jamaica:

M2= Currency in circulation + Demand deposits + Savings deposits + Time deposits

<u>Disadvantage:</u>

- Weight on each monetary component is the same and does not account for the difference in monetary service provided within the economy.

The Divisia Monetary Aggregate (DMA)

- The DMA weights the monetary components according to the degree of liquidity.
  - Economic theory – various monetary components differ in terms of their liquidity and,
  - Have different effects on economic activity

Advantage:

- Weights components according monetary (transactional) services.
- Weights can vary over time in response to factors such as a shift in the yield curve, which will alter the opportunity cost of holding the different components of broad money.

- The change in DMA index (approximated in discrete time) is defined as follows:

$$logM_t^D - logM_{t-1}^D = \sum_{j=1}^{n} s_{jt}^* \left(logx_{jt} - logx_{j,t-1}\right)$$

- Weights are defined as the expenditure shares averaged over the two periods of the change

$$s_{jt}^* = \frac{1}{2}\left(s_{jt} + s_{j,t-1}\right)$$

for $j = 1, \ldots, n$. Where

$$s_{jt} = \frac{\psi_{jt} x_{jt}}{\sum_{k=1}^{n} \psi_{kt} x_{kt}}$$

is the expenditure share of asset j during period t, and ψ_{jt} is the real user cost of asset j,

$$\psi_{jt} = \frac{R_t - r_{jt}}{1 + R_t}$$

is the opportunity cost of holding a dollar's worth of the j^{th} asset.

The DMA: Country Experiences

Stracca (2001)

- Euro Area
- This indicator would be a useful complement in the analysis of the broad MA, M3
- M3 has the largest information content for inflation from a forward-looking perspective, relative to M1 and Divisia money.

Shih (2000)

- Taiwan
- Study results favoured the use of simple-sum M2 to serve as the intermediate target variable given its strong relationship with nominal GNP
- Divisia M1B serving as an information indicator to help predict the movements in inflation.

The DMA: Country Experiences

Binner, Fielding, & Mullineux (1999)

- UK
- SSMA and DMA M4
- DMA is superior to the SSMA as a leading indicator of inflation
- The average lead time for indicators constructed using a DMA measure is notably longer than its SSMA counterpart.
- Thus the DMA would provide an earlier signal of UK inflation if adopted as a policy variable.

Data and Methodology

- Monthly data on MAs and CPI
  - March 1996 - September 2012.

- Headline inflation was computed using the annual pt-to-pt growth of Jamaica's CPI.
  - Other core measures of inflation namely CPI without agriculture and fuel (CPI-AF), CPI without food and fuel (CPI-FF), CPI Trimmed Mean as well as a novel core measure of inflation computed using the HP filter with λ = 100 were included.

- The annual pt-to-pt growth in for each MA was also computed and indexed for consistency.

Data and Methodology

- M2 – currency in circulation
  - demand deposits
  - savings deposits
  - time deposits

- M2F – M2 + foreign currency deposits

- M3 – M2 + other deposits + foreign currency deposits
- M3F – M3 + foreign currency deposits

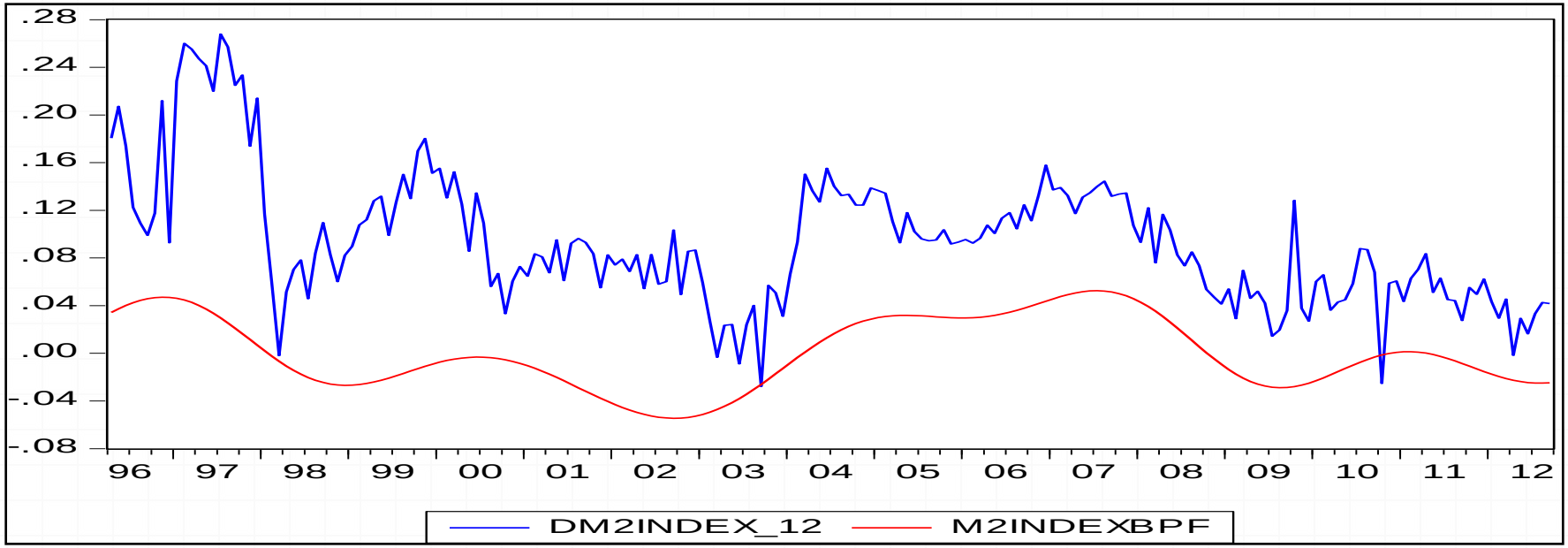
Data and Methodology

- A**symmetric band pass filter**.

- The band pass filter:
  - allows a linear transformation of data
  - eliminates unwanted components of the data
  - eliminates SR fluctuations in money growth generated by money demand shocks.

- Cross Correlation
- Granger Causality and Cointegration tests

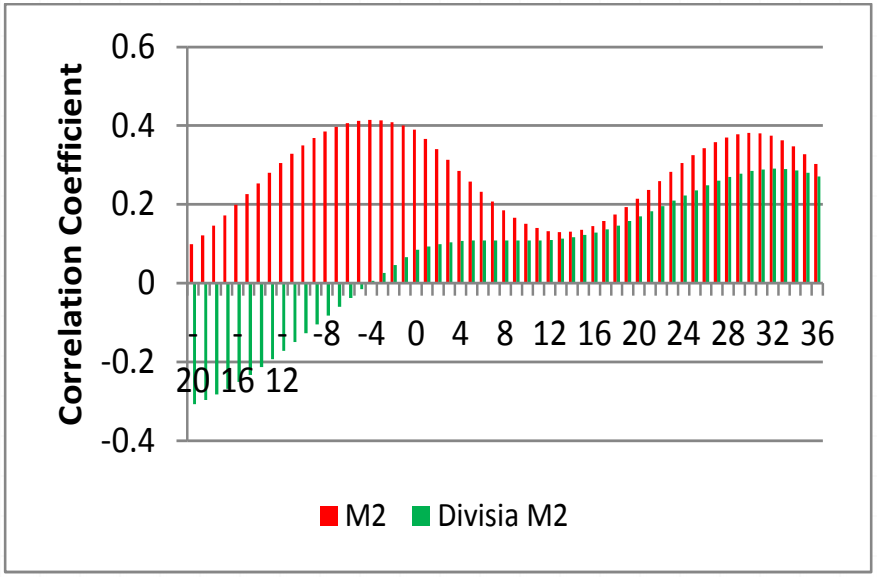
Non- Filtered vs Low Frequency Data

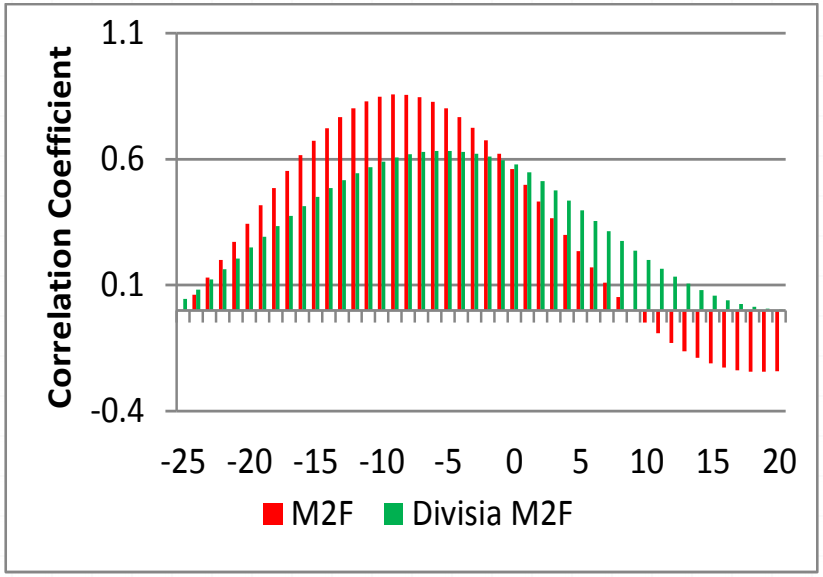


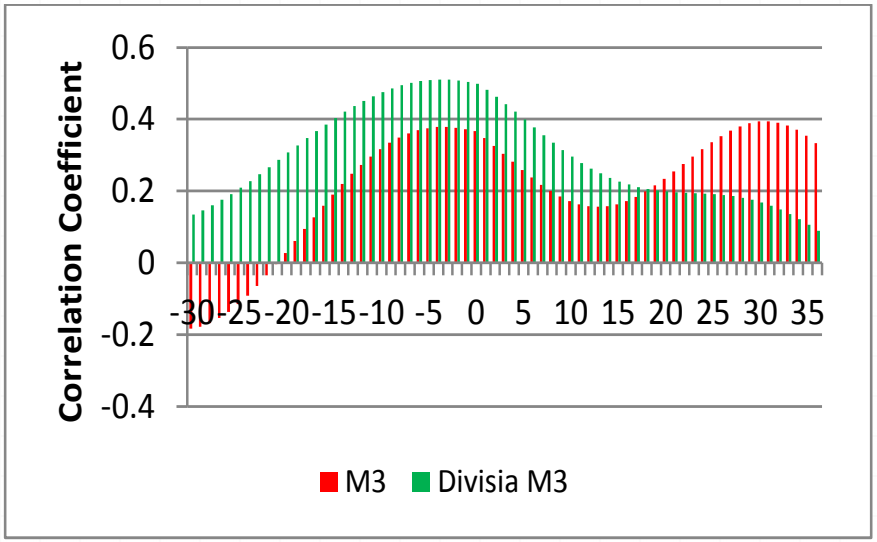
- Low frequency component derived as a residual and captures movements with a cycle length >2.75 years.

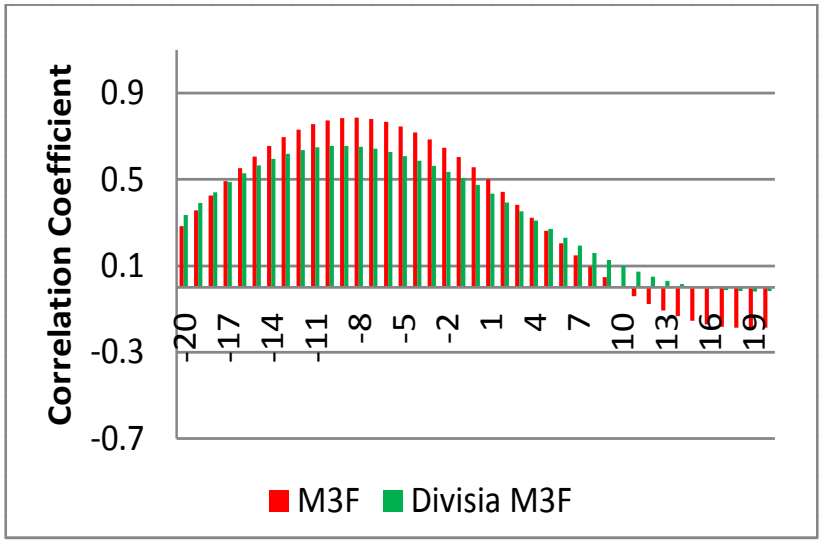
- Specifically, the low frequency follows the Business Cycle.

Results: Correlation Coefficient

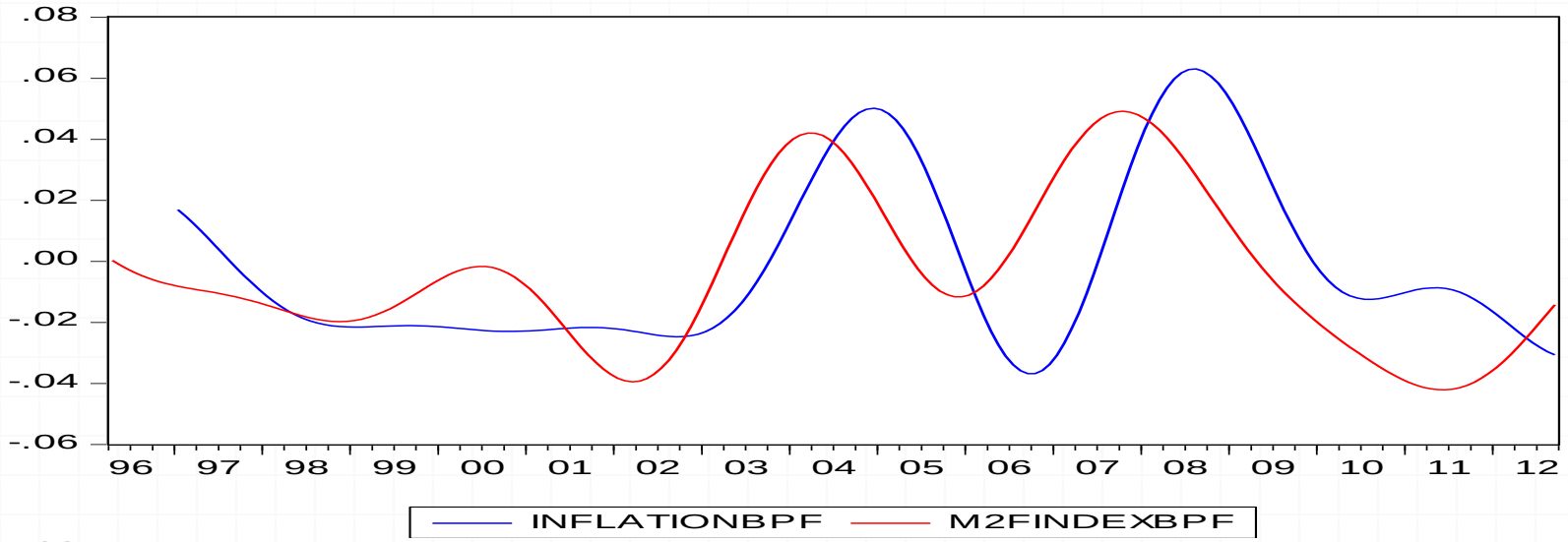


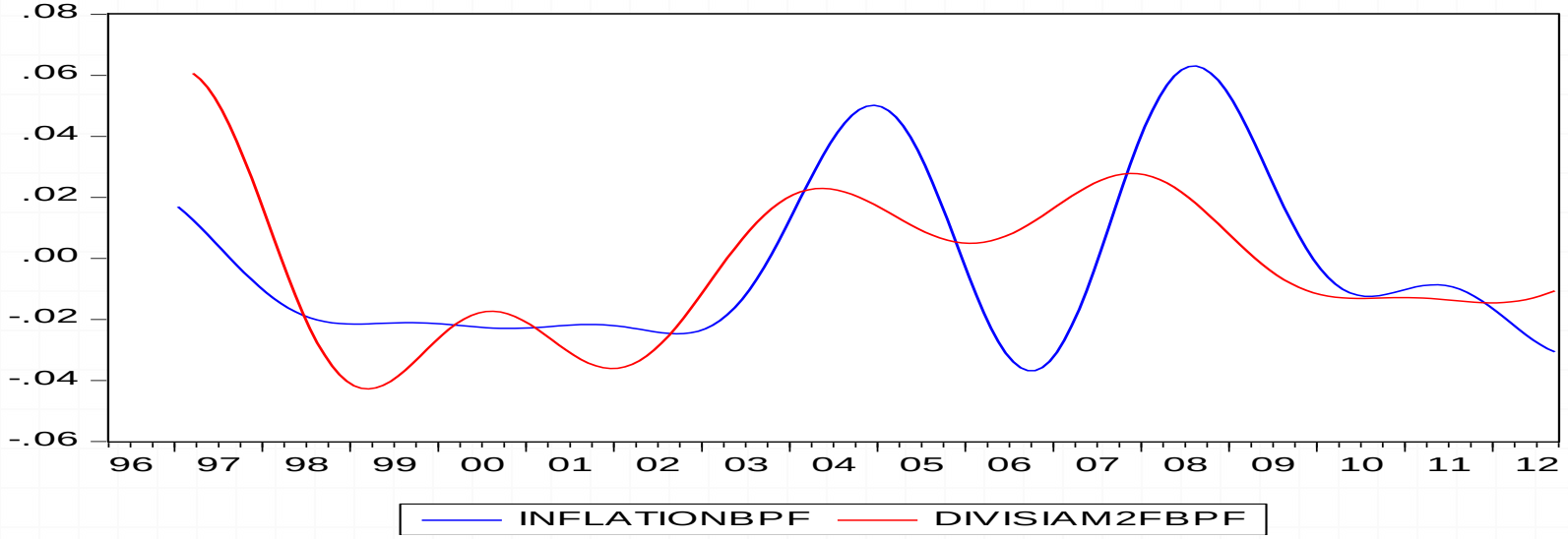






Results: Forecasting turning points in Inflation - M2F & DMA M2F





Results: Granger Causality Test

Direction of causality	Number of lags	F value	Decision
CPI → M2F	2	1.85	Do not reject
M2F → CPI	2	2.46	Do not reject
CPI → M2F	6	1.10	Do not reject
M2F → CPI	6	2.01	Do not reject
CPI → M2F	8	0.98	Do not reject
M2F → CPI	8	1.53	Do not reject
CPI → M2F	10	1.08	Do not reject
M2F → CPI	10	1.51	Do not reject
Direction of causality	**Number of lags**	**F value**	**Decision**
CPI → DM2F	2	1.85	Do not reject
DM2F → CPI	2	2.46	Do not reject
CPI → DM2F	6	1.10	Do not reject
DM2F → CPI	6	2.01	Do not reject
CPI → DM2F	8	0.98	Do not reject
DM2F → CPI	8	1.53	Do not reject
CPI → DM2F	10	1.08	Do not reject
DM2F → CPI	10	1.51	Do not reject

Results: Co-integration Test

DMA M2F

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.13	27.67	15.49	0.00
At most 1	0.00	0.85	3.84	0.36

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level

SSMA M2F

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.04	12.84	15.49	0.12
At most 1*	0.022	4.47	3.84	0.03

Trace test indicates no cointegrating at the 0.05 level

Conclusion

- SS M2F and Divisia M2F most useful for forecasting long-run changes in inflation in Jamaica.
- The information content of monetary indicators useful for monetary policy formulation and the DMA could complement current indicators.
- The construction of a DMA allows for the weighting of constituent components to produce an index which accounts for the monetary (transactional) services provided by these components.
- Consistent with previous studies, empirical analysis found strong basis for preferring simple-sum M2F to Divisia M2F as an intermediate target variable.
  - However, the DMA proves to be a useful early indicator of impending inflation.

Policy Recommendation

- A formal two-pillar approach, which incorporates both monetary and economic analysis in forecasting future price developments, may be adopted for Jamaica.

- The adoption of broad-based monetary analysis, incorporating the use of DMAs as a leading indicator of inflation will serve to complement the SSMAs that are currently being assessed.

Thank You!