



The Nature of Hyperinflations between 1980 and 2008: A Case of Three Regions

Sabelosenkosi Ndlovu

NDLSAB006

18 February 2018

A minor dissertation submitted in partial fulfilment of the degree of
Master of Commerce Specialising in Economic Development

School of Economics
Faculty of Commerce
University of Cape Town

Supervisor: Prof Mark Ellyne

School of Economics

The copyright of this thesis vests in the author. No quotation from it or information derived from it is to be published without full acknowledgement of the source. The thesis is to be used for private study or non-commercial research purposes only.

Published by the University of Cape Town (UCT) in terms of the non-exclusive license granted to UCT by the author.

DECLARATION

1. This dissertation has been submitted to the Turnitin module (or equivalent similarity and originality checking software) and I confirm that my supervisor has seen my report and any concerns revealed by such have been resolved with my supervisor.
2. This work has not been previously submitted in whole, or in part, for the award of any degree in this or any other university. It is my own work. Each significant contribution to, and quotation in, this dissertation from the work, or works of other people has been attributed, and has been cited and referenced.

Student number	NDLSAB006
Student name	Sabelosenkosi Ndlovu
Signature of Student	S. Ndlovu
Date:	18/02/2018

ACKNOWLEDGEMENTS

I would like to express my sincere gratitude to my supervisor Prof Mark Ellyne for his endless support and guidance from conceptualisation and throughout the writing phase of this dissertation. Special thanks also go to Prof Anthony Leiman for his helpful comments during the finalisation stages.

I extend my heartfelt indebtedness to family and friends for their unwavering support and constant encouragement. It is hugely appreciated.

Table of Contents

DECLARATION	ii
ACKNOWLEDGEMENTS	iii
ABSTRACT	vi
1.0 INTRODUCTION	1
1.1 Objectives of the Study	1
1.2 Background	1
2.0 LITERATURE REVIEW	7
2.1 Defining hyperinflation.....	7
2.2 Theories on hyperinflation.....	8
2.2.1 Quantity Theory of Money	9
2.2.2 Cost-push Inflation Theory	11
2.2.3 Recent Theories on Inflation.....	12
2.3 Theoretical Relationship between Hyperinflations and the Exchange Rate.....	13
2.4 Empirical Literature on the Relationship between Inflation and the Exchange Rate....	14
2.5 Empirical Literature on the Relationship between Money Growth and Inflation.....	16
3.0 MODELS AND METHODOLOGY	18
3.1 General Methodology Outline	18
3.2 General Model Description	18
3.3 Panel Unit Root Test	20
3.4 Tests	20
A. Test for Purchasing Power Parity using Real Exchange Rates	20
B. Dumitrescu-Hurlin Panel Causality Tests.....	22
C. Velocity of Money and Hyperinflations.....	27
D. Panel Co-integration Tests.....	32
4.0 CONCLUSION	36
4.1 Summary and Conclusions.....	36
4.2 Limitations of Research.....	37
4.3 Directions for Further Research	37
Reference List	39
APPENDIX.....	45
Table A1: Latin America Data Used in the Panel Econometric Analysis.....	45

Table A2: States of the former USSR Data Used in the Panel Econometric Analysis	47
Table A3: Africa Data Used in the Panel Econometric Analysis	49
EViews Technical Output.....	51
Table A4: Unit Root Tests	51
Table A5: Augmented Dickey-Fuller Test for Unit Root for Real Exchange Rate for Latin America.....	56
Table A6: Augmented Dickey-Fuller Test for Unit Root for Real Exchange Rate for States of the former USSR.....	56
Table A7: Augmented Dickey-Fuller Test for Unit Root for Real Exchange Rate for Africa..	57
Table A8: Velocity as a function of current and lagged inflation.....	57
Table A9: Panel with year dummies	58
Table A10: Panel with country dummies.....	60
Table A11: Panel Estimation of the Long Run Relationship (Latin America).....	61
Table A12: Panel Estimation of the Long Run Relationship (States of the former USSR)	62
Table A13: Panel Estimation of the Long Run Relationship (Africa)	63

ABSTRACT

This dissertation uses 13 year panel data to explore the nature of hyperinflations which occurred in 14 countries between the years 1980 and 2008. The countries are grouped into three geopolitical regions of Latin America, former states of the Union of Soviet Socialist Republics (USSR) and Africa. The analysis principally uses the quantity theory of money (QTM) and the purchasing power parity (PPP) as theoretical frameworks.

The Dumitrescu-Hurlin panel causality is used to examine the nature of the relationship between exchange rates, money supply and price levels during the hyperinflationary periods. Notable similarities regarding the causal relationships, particularly between money supply, and price levels were found.

Exchange rate depreciation-inflation spirals are examined using the PPP hypothesis. Over the 13 year periods under investigation, the findings suggest that prices and exchange rates did not tend to move together in all the cases. The impact of hyperinflations on the velocity of money is investigated for the three regional cases, following which the long-run relationship between QTM variables is tested using Pedroni residual co-integration. Despite the substantial dissimilarities in inflation rates and velocity in the countries, there seems not to be significant differences in the impact of hyperinflations on velocity. In examining whether a long-run or equilibrium relationship existed between inflation, money growth and real output during the hyperinflationary periods, the findings suggest it was not the case in all instances.

Although the econometric results accord with findings in the relevant literature, it is apparent that despite the generic systematic features which typify the phenomenon, the hyperinflationary experiences have not been uniform and have taken different paths.

1.0 INTRODUCTION

This paper explores the characteristics of various hyperinflationary episodes between 1980 and 2008 in an effort to determine whether they were homogeneous and followed similar paths. The relationship between inflation, money growth, exchange rates and velocity of money during 14 hyperinflationary cases is examined. While it is widely understood that, Friedman and Schwartz (1963) argued, “inflation is always and everywhere, a monetary phenomenon”. This is merely a useful point of departure in the analysis of hyperinflations; the dynamics of the phenomenon seemingly vary on a case by case basis.

1.1 Objectives of the Study

There is extensive literature that investigates the country-specific dynamics of hyperinflations. However, only a few recent-time regional comparative analyses of the phenomenon exist (Makinen, 2014; Deniz, Tekce and Yilmaz, 2016). Moreover, studies of inflation in developing and transitional economies have largely focused on its implications for economic growth. Hence, this study attempts to characterise the regional hyperinflationary waves between 1980 and 2008, to find similarities and to:

- ascertain if there is any consistent Granger causality between money growth, inflation and exchange rate depreciations.
- investigate the impact of hyperinflation on the exchange rate, particularly to determine whether purchasing power parity (PPP) holds.
- investigate the relationship between velocity of money and inflation during hyperinflationary periods.
- examine whether a long-run or equilibrium relationship existed between inflation, money growth and real output during the hyperinflationary periods.

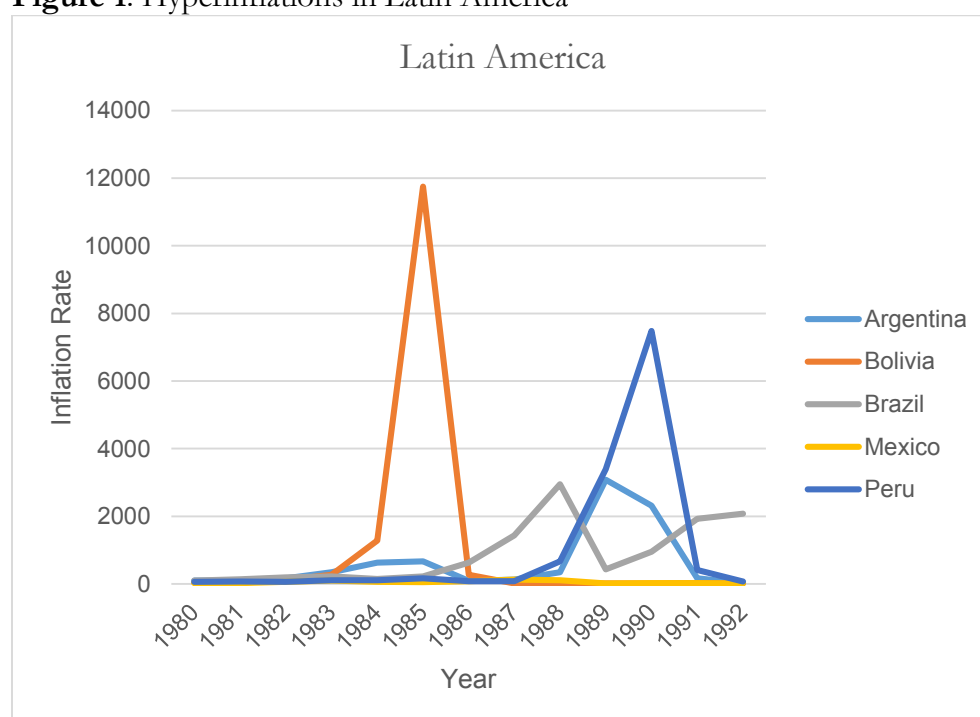
1.2 Background

Instances of hyperinflations since the 1980s have tended to occur in waves owing to generalised politico-economic conditions. The first wave plagued Latin America in the 1980s to early 1990s. The second was witnessed in the early 1990s former states of the Union of Soviet Socialist Republics (USSR); during their transition to market economies- after the dissolution of the

Communist bloc. In the case of the African continent, hyperinflations have largely been post-independence phenomena.

The Latin American wave of hyperinflations was one of the most prominent, post-World War II (Figure 1).

Figure 1: Hyperinflations in Latin America



Data source: World Development Indicators database

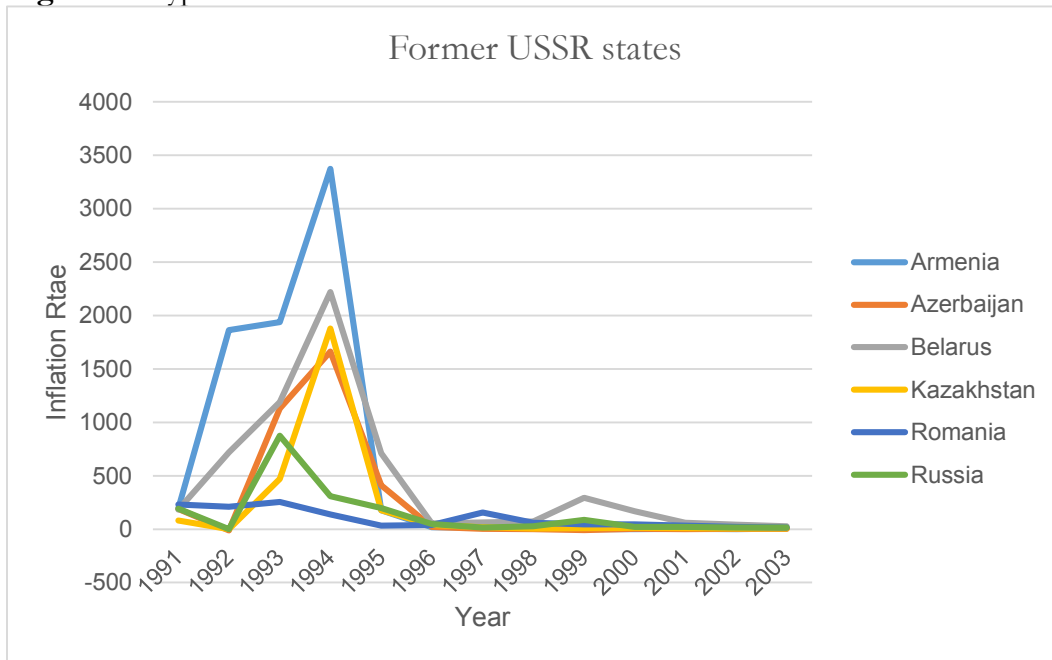
The particularly striking aspect about the wave was that it occurred during a period when most countries were experiencing low rates of inflation the world over. The most notorious experiences were the cases of Bolivia and Argentina where annual rates of inflation (measured as a percentage change in the Consumer Price Index) reached peaks of 11750% and 7482% in 1986 and 1990 respectively (World Development Indicators, 2016). During the same period, inflation in Brazil hovered around 1000% in four of the five years between 1989 and 1993 (Bernanke, 2005).

The hyperinflations owed largely to the debt crisis which engulfed Latin American countries between 1970 and 1980. In the preceding decades, many Latin American countries embarked on infrastructural development drives, largely financed through foreign borrowing. This massive borrowing led them to quadruple their external debt from US\$75 billion in the mid-1970s to above \$320 billion in ten years, or 50% of the region's gross domestic product (GDP) (Latin American

Inflation, 1998). The economic consequences were catastrophic, and hyperinflationary episodes were witnessed in most of the countries in the region. Carlson (2013) proposes that the monetisation of the debt burden resulted in the high rates of inflation. However, Bernanke (2005) contends that the current consensus among economists- that money growth generated by fiscal deficits is the driving force behind virtually all episodes of very high inflation- did not always hold sway in the region. In his view, poor macroeconomic performance as a result of ideas and politics, which in turn influenced economic policies, could better explain the hyperinflations during the period.

The second hyperinflationary wave was witnessed in the 1990s in a number of Eastern European and Central Asian countries. The disintegration of the USSR in 1991, and the subsequent transitioning of member states' political economies brought many challenges. In the early 1990s, reckless fiscal and monetary policies drove inflation to astronomical levels, leading to much economic damage in the form of major recessions and output losses in these post-communist countries. Filatoshev and Bradshaw (1992) state that hyperinflations in these former socialist countries were fuelled by a variety of factors, varying in strength and importance over the period. These included: the transfer of administrative powers within the productive sectors, from the Communist party to the workers' unions, transfers that were unaccompanied by the introduction of competition or the institution of bankruptcy. The results included wage increases unaligned with labour productivity; broadening gaps between the volume of output and nominal demand; and macroeconomic financial disequilibria due to shortfalls in the all-union budget which had to be settled by 'monetisation' of fiscal deficits through increases in money supply. The most extreme cases were those of Armenia and Belarus, where the inflation rates reached peaks of 3374% and 2221% in 1994 respectively (Figure 2).

Figure 2: Hyperinflations in former states of the USSR

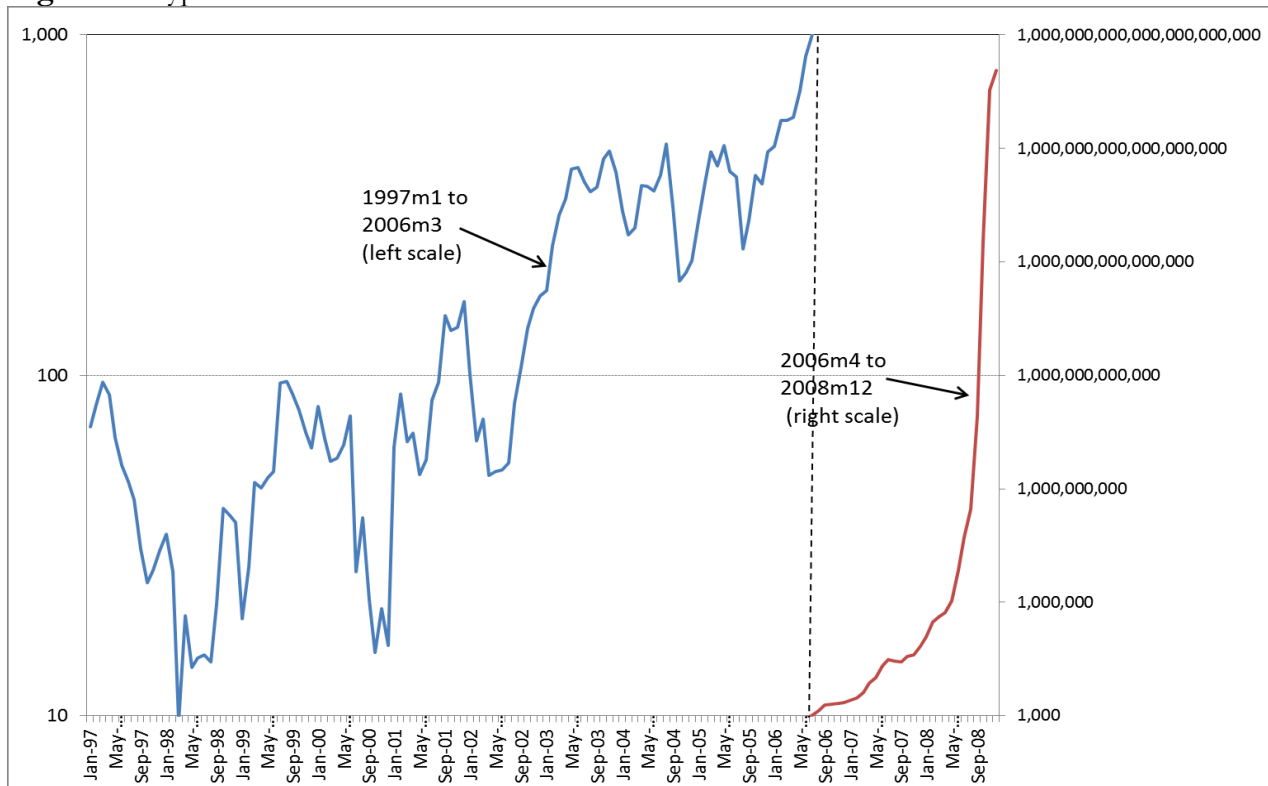


Data source: World Bank's Statistical Handbook

This wave largely occurred after the political and economic disintegration of the Union, which saw the introduction of local currencies and the crowding out of the common USSR Rouble from circulation. The resulting 'regionalisation' of the former Soviet monetary system worsened the economic situation. The lack of financial discipline by governments in the newly sovereign states also inevitably led to the perpetuation and fragmentation of the inflationary process itself (Filatoshev and Bradshaw, 1992).

Post-independence Africa had its own fair share of challenges as well, particularly on the economic front. The new millennium saw increased economic constraints for Sub-Saharan Africa in the form of chronic as well as hyperinflations. The Zimbabwean case which reached an estimated peak of 89.7 sextillion % at the last official estimation in 2008 being the worst the continent had ever witnessed (Mabhula, 2010; Hanke and Krus, 2012)(Figure 3).

Figure 3: Hyperinflation in Zimbabwe



Source: Ellyne and Daly (2014)

The roots of African hyperinflations have been fundamentally political in the form of funding patronage systems through increases in money supply. Coomer (2014) points out that the roots of the Zimbabwean hyperinflation can be traced to the expenditures the government financed through money printing under mounting political pressure in late 1997. Various studies have also attributed hyperinflations in African countries to a range of factors including, economic mismanagement, political instability and its attendant challenges, and commodity price shocks (Asekunowo, 2016; Makochehanwa, 2008; Hanke and Krus, 2012).

There have been outlier hyperinflationary incidents since 1980, notably in Central Asia (not part of former USSR) and the Middle East, which were not included in this study.

To realize the study objectives, Chapter Two defines hyperinflation and explores the theoretical and empirical literature on the relationship between the variables to be investigated. Chapter Three presents the methodology used to analyze the nature of hyperinflations for the 14 countries under study, and summarizes the results from the econometric analyses undertaken. Chapter Four concludes the paper and outlines possible areas for further studies.

2.0 LITERATURE REVIEW

This section reviews the concept of hyperinflation, and then explores the various theories on the relationships among price levels, money supply and exchange rates during hyperinflations. The focus is mainly on the quantity theory of money and the purchasing power parity hypothesis as they are the basic premises underlying the study.

Numerous scholars have attempted to define hyperinflation; particularly the distinction between chronic, persistent, and hyper inflations. A considerable body of knowledge on hyperinflations exists, which principally defines the phenomenon on the basis of post-World War I experiences in Europe. Hanke and Krus (2012) acknowledge that literature on hyperinflations is prone to vagueness. They particularly point out that hyperinflation is an economic malady that arises under extreme conditions such as political mismanagement, conflict situations, and the transition from command to market-based economies, among other unique circumstances.

2.1 Defining hyperinflation

The definitions of hyper and chronic inflation have been a subject of much contention; the key issue being the distinctions between ‘normal’ inflation, ‘chronic or persistent’ inflation and ‘hyper’ inflation. Cagan (1956; 25) defines hyperinflation as “...beginning in the month the rise in prices exceeds 50% and as ending in the month before the monthly rise in price drops below that amount and stays below for at least a year”. Although the Cagan definition is the most widely used, other studies attempted to define the phenomenon from different vantage points. Dornbusch, Sturzenegger and Wolf (1990), on the other hand, state that yearly inflations rates above 1000% count as hyperinflation. However, Capie (1986; 117) characterises a hyperinflationary period as one “when price rises reach an annual rate of...100% in any one year”. This study uses the Capie (1986; 117) definition to identify hyperinflations.

In contrast to hyperinflation, Pazos (1972), in dissecting the distinctions, points out that chronic inflation is characterised by two notable features: its long duration and its relative stability. Chronic inflation occurs over a long period of time, prolonging for up to a decade. Unlike hyperinflations which tend to fluctuate and to spiral upward before being checked, chronic inflations tend to remain stable in a constant high inflation band. Dornbusch and Fischer (1993; 22) hold that

moderate inflation is persistent inflation of between 20% and 30%, “too high to be disregarded and to permit a fixed exchange rate but also too low to warrant the apparent political and economic costs of a frontal attack on the problem.”

The distinction between moderate and hyperinflation is not hard to discern. Coomer (2014) identifies the common characteristics of most hyperinflationary periods as being relatively short-lived and highly explosive in nature. The relatively short duration of hyperinflationary epochs is closely related to their highly unstable and volatile nature (Bruno, 1991). However, in all instances, economic analysts are quick to state that high rates of inflation, whether hyper or chronic, have detrimental effects on the economy and on livelihoods. High rates of inflation represent a virtual collapse of the monetary system, if not the economy as a whole, and thus call for concerted efforts; both monetary and fiscal interventions to bring about socio-economic stability (Coomer, 2014).

Historically, hyper and chronic inflationary episodes have not been necessarily mutually exclusive. It has been observed that, if persistent inflation is not dealt with and terminated, it has the potential to metastasise into hyperinflation. Reinhart and Savastano (2003), for example, observe that many hyperinflations were preceded by years of chronic inflation, which eventually spiralled into ‘runaway’ inflation, the Latin American experiences being a case in point. Fischer (1994) notes that since 1947, hyperinflations in market economies have been rare. Much more common have been longer periods of chronic high inflation, with inflation rates above 100% per annum. Such chronic inflation can be prolonged, spanning up to seven years, with monthly rates of inflation lying between 5% and 25% or annual rates in triple digits (Bruno, 1991).

2.2 Theories on hyperinflation

Numerous hypotheses and schools of thoughts which seek to explain the incidence of ‘runaway’ inflation have emerged since the 18th century. The leading hyperinflation hypotheses are the quantity theory of money, demand-pull inflation theory, cost-push inflation theory and theories on structural complexities. The paper delves into these theories before analysing the 14 cases under investigation.

2.2.1 Quantity Theory of Money

The premise of the Quantity theory hypothesis is that hyperinflations result from excessive money growth i.e. changes in the price level are primarily determined by fluctuations in the quantity of money in circulation (Totonchi, 2011). Joplin (1826; 67) laid the groundwork by asserting that, "...there is no opinion better established, though seldom consistently maintained, than that the general scale of prices existing in every country, is determined by the amount of money which circulates in it." Friedman (1992) buttressed the assertion by noting that, "...inflation is always and everywhere a monetary phenomenon." In this sense, hyperinflation can be averted simply by keeping the money supply growth rate in check.

The concept was first popularised by Hume (1749) in his 'price-specie flow' argument against mercantilism, then extrapolated into the case of many countries. It was explored by the followers of the school of Salamanca who observed in 16th century Europe that inflows of silver and gold, used in the coinage of money from the rest of the world, led to price increases. The theory went on to be developed by Irving Fischer in the 20th century. He formulated the equation:

$$MV = PT \quad (1)$$

Where M = money supply

V = velocity of money circulation

P = price level

T = volume of transactions within the economy

In its rudimentary form, the theory assumes that V (velocity of money circulation) and T (volume of transactions within the economy) are constant in the short-run. However, this assumption has been criticised on the basis that; as velocity is dependent on various decisions taken by economic agents, it cannot be constant.

The Quantity theory states that fluctuations in the quantity of money lead to proportionate changes in the price level, i.e. excessive money growth is inflationary. Broadly, the implication of the theory is that the value of money is, by and large, determined by the amount of money.

There is ample empirical evidence supporting the hypothesis. Post-World War I studies on hyperinflations argued that excessive money supply could explain almost all the hyperinflations during that time. After the War, printing money was clearly a convenient way of raising resources during the reconstruction efforts (as well as payment of reparations for the vanquished) for most countries. Many governments resorted to it as alternative revenue sources were not feasible. Their tax bases had substantially shrunk as a result of the war. External borrowing was also not a viable avenue (Fergusson, 2010).

The 'state of chaos', which was also evident before and during the hyperinflationary period in Zimbabwe (Makochekanwa; 2007), buttresses this theory. In the case of Zimbabwe, imprudent political and economic decisions led to unbudgeted expenditures and money printing with reckless abandon. The period mid-1997 to 2008, saw a gradual but consistent increase in money supply to unsustainable levels. This provided the basis for the record hyperinflation and consequent socio-economic crisis, which peaked in 2008.

Similarly, Morales and Sachs (1989) identified excessive money growth, which underpinned the debt crisis of the 1980s, as a factor in the prevalence of hyperinflations in Latin America. The source of the money supply increases was not the same. However, most of the Latin American economies ran large budget deficits and external debt, which were subsequently financed through seigniorage. Coomer (2014) recounts that the low interest rates on international loans were perceived to be permanent. As a result, countries borrowed large sums in the expectation that real interests would remain low. The interest rate increases that followed prompted many governments to print money to settle obligations, resulting in high rates of inflation across the region. Fischer et al (2002) showed that the "fiscal deficits indeed explain high inflation using standard regression techniques".

Closely aligned with the Quantity Theory of Money (QTM) is the demand-pull inflation hypothesis. It states that excess demand in an economy leads to inflationary pressures. Aggregate demand comprises of investment, government expenditure and consumption. Inflationary pressures then emanate from instances whereby the value of aggregate demand outstrips the value of aggregate supply, characterised by the Keynesian school of thought as 'too much money chasing too few goods.' In developing countries, excess demand is often driven by rises in government

spending. In exploring the causes of hyperinflation in Zimbabwe, studies identified imprudent expansionary policies such as quasi-fiscal and unbudgeted expenditures by the central bank and government as responsible for the hyperinflation that plunged the country into the debilitating 2008 socio-economic crisis (Makochekanwa, 2007; Coomer, 2014).

The Monetarist School, led by Milton Friedman (1968), treated inflation as a monetary phenomenon caused by expansionary monetary and fiscal policies such as government deficit financing and expansionary credit policies. Monetarists hold the view that expansion in the money supply has a large and direct positive influence on output, but only in the short run. In the long run, a rise in the money supply does not affect real output. The theory emphasizes that the control of inflation requires as a necessary and sufficient condition; the control of money supply such that it grows in tandem with the growth of money demand at stable prices (Ghatak, 1995).

2.2.1.1 The Relationship between Velocity and Inflation

As has been discussed in 2.2.1, the quantity theory of money in its rudimentary form states that price levels are determined by money supply, assuming real gross income and velocity of money are constant. There is much contestation among researchers as to the relationship between inflation and velocity. An increase in the velocity of money is aptly characterized by Dornbusch, Sturzenegger and Wolf (1990) as “flight from money” which may be in the form of a switch to foreign currency, interest bearing deposits or other tangible investments and assets. The classical assumption about velocity is that it changes in a stable and predictable manner in the long run. However, intuitively, velocity is not expected to be stable (either in the short and long run), more so during periods of high inflation (Syrotian 2012; 2). Melitz and Correa (1970) acknowledge the international differences in velocity of money. They argue that developing countries are characterized by high variability in velocity as compared to advanced economies.

2.2.2 Cost-push Inflation Theory

The Cost-push theory attributes inflation to supply-oriented factors which alter the price levels in an economy. Laughlin (1909) identified three types of cost-push mechanisms; namely, administered pricing, commodity shortage, and wage-push. The premise of the theory is that real disturbances which affect production costs lead to changes in price levels (inflation) (Humphrey,

2004). It holds that inflation is driven up by incessant price increases due to an upward 'push' in production costs. A rise in production costs in an economy may be driven by factors such as an increase in labour costs due to the bargaining power of trade unions or an upward surge in global oil prices, which become a significant source of inflationary pressures. For instance, the fall of the USSR communist bloc and the subsequent transfer of administrative powers within the productive sectors from the Communist establishments to workers' unions, unaccompanied by the introduction of competition nor the institution of bankruptcy is identified to have subsequently led to wage setting unaligned with labour productivity. This contributed to the chronic inflation spell, which subsequently ushered in a wave of hyperinflation in the former states of the USSR.

Labour market rigidities and cost dynamics are also widely thought to be sources of inflationary pressures, especially in developed countries. In exploring the causes of persistent inflation in Nigeria from 1973 to 1993, Asekunowo (2016) points out that the ability of unionized labour to use its market and political muscle to demand wages above firm productivity gains was partly to blame for the high rate of inflation during the period.

Some scholars argue that cost-push theory explains relative price level changes, rather than the aggregate price levels in an economy. In refuting its empirical applicability, Fischer (1982) argued that because the identified causes of inflation (as postulated by cost-push theorists) occur sporadically and are short-lived, they could not explain a sustained rise in aggregate price levels which characterizes hyperinflationary episodes. He reasons that the price level can only be affected through changes in the stock of money, its circulation velocity, or the physical volume of trade. If these magnitudes remain constant, price levels would not be expected to change.

2.2.3 Recent Theories on Inflation

Recent literature on inflation lays much emphasis on the structural and political sources of inflationary pressures. It identifies roles for political (in)stability, (low) credibility of governments, and electoral cycles in explaining inflationary pressures. As political instability and macroeconomic instability largely go hand-in-hand, in developing countries; these factors cannot be discounted

especially in countries characterized by poor institutional frameworks or imprudent economic policies driven by political expediency (Edwards, 1994; Aisen and Verga, 2005; Barugahara, 2014).

Unlike common rises in price levels, true hyperinflation can only be best explained as a consequence of the interplay of real phenomena. This interaction explains the inherent complexities which characterise hyperinflations.

2.3 Theoretical Relationship between Hyperinflations and the Exchange Rate

On the relationship between exchange rates and high rates of inflation, the purchasing power parity (PPP) theory (Gustav Cassel 1922 in Taylor and Taylor 2004, pp.135) identifies a fundamental relationship between the exchange rate and the price level.

Simple purchasing power parity means that rising prices in a country will weaken its exchange rate, causing imports to rise in price, if the domestic economy is import reliant, which further inflates domestic prices. A more complex version of this is described by Makochekanwa (2007) using a rational expectations framework whereby a persistently high inflation rate tends to reduce the value of the domestic currency. Under the PPP hypothesis, the real exchange rate should move in response to changes in the relative price levels. Therefore, if economic agents lose confidence in a domestic currency (when they no longer believe the currency will retain its purchasing power), they endeavour to exchange it for a more stable foreign currency. Consequently, as purchasing power of the home currency declines further, so its value in relation to stable foreign currencies accelerates downward, and the domestic prices of goods and services sold in the 'troubled currency' soar.

The expectation is that the purchasing power parity hypothesis would hold in countries experiencing high rates of inflation as the exchange rate depreciates in line with price increases. Furthermore, the investigation of the purchasing power parity hypothesis is informed by the generally considered view that exchange rates fluctuations do have a strong impact on price levels. Depreciation or devaluation of a domestic currency is expected to affect price levels. Alba and Papell (2007) note that when a particular country's domestic price level is increasing more rapidly than a stable foreign currency, that country's exchange rate must depreciate so as to revert to PPP equilibrium level. The long-run PPP relationship is considered an equilibrium condition of money

neutrality in the global economic setting, and some previous studies have found it to hold best during hyperinflationary periods (Al-Gasaymeh and Kasem; 2015).

Exchange rate fluctuations have also been seen to affect the inflation rate. Simplistically, a depreciation of the domestic currency tends to exert inflationary pressures on the economy. As imports become more expensive than exports, the domestic economy tends to become more exposed to imported inflation, (when the price of imports go up as it becomes more expensive to buy from abroad); as well as demand-pull inflation, largely due to an increase in demand for domestically produced foreign tradable goods. There is a further cost-push in the import substituting sector as domestic manufacturing firms have reduced incentives to control costs (Mishkin, 2011).

2.4 Empirical Literature on the Relationship between Inflation and the Exchange Rate

In analysing Zimbabwe's record hyperinflation between 2006 and 2008, Mandizha (2014) investigated if there was any causal relationship between the 'runaway' inflation and the depreciating Zimbabwean dollar. Using monthly data from 2001 to 2005, the study concluded that exchange rate depreciation was to blame for the hyperinflation in the short run. However, beyond this timeframe, the study discovered bidirectional causality between the two variables. The results indicated the importance of differentiating between short and long run causalities, if policymakers are to develop effective policies to prevent hyperinflation and stop the depreciation of inflationary currencies.

Maswana (2006) examined the causal interaction between inflation and the exchange rate in the Democratic Republic of Congo (DRC). The study partly included the inflationary period experienced in DRC from the mid-1990s to the early 2000s. Applying a bivariate framework, the investigation found bidirectional short-run Granger causality between inflation and the monthly rates in the parallel market for foreign exchange. Further analysis, using the Hsiao version of the Granger non-causality test, suggested that exchange rate fluctuations caused inflation in the short-run, as regression results showed feedback causality between the two variables. In the long run, the relationship was far simpler, exchange rate fluctuations resulted in inflation without any feedback effect. These results were consistent with those of Canetti and Greene (1991), and

Durevall and Ndungu (1999), which pointed out that the proximate determinant of inflation in the long run is the exchange rate. Notably, “exchange rate depreciation itself contributes to further inflation in the manner of a self-fulfilling prophecy...” (Durevall and Ndungu).

Sanusi (2002) estimated the pass-through effects of exchange rate changes on consumer prices in the Ghanaian economy. The findings showed that the pass-through, although incomplete, was substantial- signifying that exchange rate depreciation was a key source of inflation. However, using variance decomposition analysis, the study further concluded that monetary expansion was an even more important explanatory factor than the depreciation of the exchange rate. The study stressed that other studies in Sub-Saharan Africa had suggested that consumer prices were not sensitive to fluctuations in the exchange rate.

In a Latin American study, Kamin (1997) showed that in the case of Mexico, the real depreciation of the local currency had a strong inflationary bearing. Similarly, Calvo et al. (1994) found that in the cases of Brazil, Chile and Colombia, undervalued real exchange rates were associated with higher consumer price inflation. Overall, it thus appears that not only changes in the nominal exchange rate but also the level of the real effective exchange rate are correlated with the rate of inflation.

In an investigation of exchange rate pass-through and domestic inflation, Takatoshi and Kiyotaka (2007) compared cases in East Asia and Latin America. The study is significant as the period under investigation included the hyperinflationary years experienced in most of the countries under study. Using structural vector auto-regression to examine the degree of domestic price response to exchange rate fluctuations, the results suggested a causal relationship between exchange rates and inflation. While their results parallel those just described, of Maswana (2006), and Durevall and Ndungu (1999), Takatoshi and Kiyotaka stressed that reverse causation could not be ignored. The paper concluded that high exchange rate pass-through was the primary cause of the high inflation rates recorded in post-crisis East Asia and Latin America. In Indonesia, however, the study found that ‘massive’ changes in the money base played an important role.

Closely tied in with hyperinflations, Ito and Sato (2007) conducted a study in Latin America and concluded that the degree of exchange rate pass-through to the price level is high in countries

experiencing currency crises. The deductions were made during the countries' currency crises, which soon became hyperinflationary. High currency volatility was seen to play a major role in determining the inflation rate in the short run. Similar findings came from Omotor's (2008) exploration of the effect of exchange rate depreciation on inflation in Nigeria, which concluded that inflation was largely determined by money creation, exchange rate depreciation and real output growth.

Lastly, Holod (2000), using Identified Vector Auto-regression approach, estimated the relationship between consumer price index, money supply and the exchange rate in Ukraine,. The study concluded that exchange rate targeting can serve as an efficient intermediate for monetary policy since exchange rate shocks significantly influence price level behaviour. Interestingly, although Holod found some evidence that positive money supply shocks led to a rise in the domestic price level, the results showed that the influence was not very strong.

2.5 Empirical Literature on the Relationship between Money Growth and Inflation

Studies largely agree about the role of monetary growth either as the main driving force behind inflation or as a necessary element in accommodating it when triggered by other factors.

In testing whether the money-inflation link is valid in the short-run, Fischer et al (2002) ran a panel regression with annual data for 94 countries, in which they allowed for two lags of money growth. Their results show that the money-inflation link was 'exceptionally' strong for most countries, both in the short and long run. Testing the same relationship in India, Waingade (2011) found that, over a long period, there existed a positive correlation between growth in money supply and price level. The growth in money supply had in most instances exceeded the growth in price level, with the gap between the two explained by the growth in real national income. This is consistent with the Cambridge cash-balance framework, which emphasises the role of institutional and psychological factors in influencing the public's desire to hold cash balances (Humphrey, 2004).

In a study of the Maghreb region economies, Darrat (1986) tested the direction of causation between money growth and price levels in Morocco, Tunisia and Libya between 1960 and 1980. The results indicated unidirectional causality running from money supply to price changes without

feedback for the three countries. Cheng and Tan (2002) also investigated the long-run equilibrium relationship and causality between inflation and its determinants (i.e. money supply, output, interest rate, exchange rate and trade balance) in Malaysia. Using the Johansen's Co-integration test and Vector Error Correction Models, their results suggested the existence of co-integration among the variables. Their results also showed no evidence of direct causality running from money supply to inflation in Malaysia.

A study by Choudhry (1995) explored the relationship between money stock and inflation in Argentina during the period 1935 and 1962. Although the study did not include the hyperinflationary period of 1980 to 1991, the findings are indicative. The results suggested the existence of a bidirectional causal relationship between real aggregate money growth and inflation. On the other hand, Makinen and Woodward (1989) discovered the existence of unidirectional causality between money growth and inflation, with the causality running from inflation to money growth in hyperinflationary Taiwan. They were, however, quick to point out that the direction of causality -if any- seemed to be unclear and inconclusive in the case of developed countries.

Lastly, using the quantity theory of money framework, Pinga and Nelson (2001) investigated the relationship between money supply and aggregate prices for 26 countries and found ambiguous results. Their results showed no causality between price changes and money growth in one of the countries- Malaysia. They also found a causal relationship between aggregate prices changes and money supply in Chile and Sri Lanka. However, they revealed that most countries exhibited mixed evidence of money supply endogeneity, with bidirectional causation between money supply and aggregate prices as a common result.

Although some of the studies were not conducted in hyperinflationary economies, the empirical findings are indicative and helpful. The main deduction from empirical evidence is that the interplay and links between money growth, exchange rate depreciations and inflation are strong, especially in the case of developing and transitional economies.

3.0 MODELS AND METHODOLOGY

3.1 General Methodology Outline

The study examines three regional panels drawn from 14 Latin American and African countries, and former states of the USSR which experienced hyperinflation between 1980 and 2008. The sample consists of five Latin American countries between 1980 and 1992 (Argentina, Bolivia, Peru, Mexico, Brazil); three African countries, between 1988 and 2008 (Angola, Democratic Republic of Congo, Zimbabwe); and six former states of the USSR, between 1991 and 2003 (Armenia, Azerbaijan, Belarus, Kazakhstan, Romania, Russia)¹. The countries are grouped into three geo-political regions as identified. Some countries which also experienced hyperinflations during the period under study were excluded due to data unavailability.

The analysis begins by examining the statistical properties of variables for each regional panel, the behaviour of exchange rates during the periods under study is then investigated. Panel causality tests are conducted and analysed, followed by the examination of the relationships between velocity and current and lagged inflation rates. Lastly, the analysis includes co-integration tests and conclusions as to the long run relationships between money growth, inflation and real output during hyperinflationary episodes. Annual data is used throughout the paper.

3.2 General Model Description

The general model of the panel study takes the following form:

$$\Pi_{i,t} = (\beta \cdot \Pi_{i,t-1}) + a + \delta \cdot X_{i,t} + \xi_i + e_t + v_{i,t} \quad (2)$$

Where:

- $\Pi_{i,t}$ is the inflation rate
- $\Pi_{i,t-1}$ is the lagged value of inflation rate; and
- $X_{i,t}$ is taken to be a vector of variables that determine the inflation rate

¹ The data for many of the former USSR countries were only available in the World Bank's Statistical Handbook: States of the Former USSR. In this publication, the authors stated that the data should be viewed with an extra degree of caution because the statistics were taken from the corresponding official internal government source and not independently reviewed by the World Bank. However, these statistics are official and are the only source of data available for the corresponding time periods for each country.

- The subscript $i = 1, 2, 3 \dots N$ represents the cross-sectional units; whereas $t = 1, 2, 3 \dots N$ refers to the time periods.
- ξ_i allows for cross-sectional fixed effects; and
- ℓ_t allows for time effects common to all cross-sectional units
- $v_{i,t}$ is the error term.

A fixed effects model is employed in an attempt to capture the unobserved country-specific and/or period-specific heterogeneity within the country panel data sets (Deniz, Tekce and Yilmaz; 2016, 237). The foremost variables employed in the investigation are as follows: inflation, real exchange rates, money supply and real output.

i. Inflation

The consumer price index (CPI) is used as the empirical measure of price levels. CPI inflation data was obtained from the International Financial Statistics and individual country databases. The annual inflation rate is taken to be the year-on-year percentage change in average annual CPI.

ii. Exchange Rates

Official nominal exchange rates (NER) datasets (except for Zimbabwe)² were obtained from the World Development Indicators as well as central bank databases. The real exchange rates (RER) were calculated using nominal exchange rates (NER) and the relative consumer price levels as illustrated in section 3.4 below.

iii. Money Supply

Broad money (M2) was used to estimate money supply and money growth rates (the annual change in money and quasi money). M2 instead of M1 (narrow money) was preferred as it includes assets that are highly liquid and therefore good substitutes for cash. A number of researchers on hyperinflation also used broad money because transactions in contemporary economies often involves transfer between different account types, thus M2 becomes a better measure for money supply. Data was sourced from the Bank for International Settlements, and individual country central bank statistical databases.

iv. Real Output

² In the case of Zimbabwe, a representative parallel market exchange rate, obtained by the Reserve Bank of Zimbabwe through survey was used. This is because the bulk of foreign currency dealings during the crisis period took place in informal markets.

Real output is measured as the individual country's gross domestic product (GDP) (in constant 2005 US\$) obtained from the International Monetary Fund and World Development Indicators databases.

3.3 Panel Unit Root Test

Asteriou and Hall, (2011: 339) point out that estimations using non-stationary data may result in spurious regressions. Augmented Dickey- Fuller (ADF) tests were used for the panel unit root tests for the three regional panels; they indicated that all variables were non-stationary in levels but only become stationary after first and second differencing (Tables A4 in appendix). This was expected due to the volatility associated with hyperinflationary periods. As non-stationary data are unpredictable and pose a challenge in economic modelling, the variables of interest were transformed by first and second differencing using EViews in order to ensure the panel causality tests and the rest of the tests give fairly consistent results.

3.4 Tests

A. Test for Purchasing Power Parity using Real Exchange Rates

The same non-stationarity test (ADF) was used to establish whether the purchasing power parity (PPP) hypothesis held in the three regions, and maintained a stable relationship between exchange rate fluctuation and money growth dynamics during hyperinflationary periods. If PPP holds, the exchange rates should appreciate or depreciate in response to changes in the relative price levels. The real exchange rates are expected to remain constant if PPP holds such that:

$$RER = NER * CPI_{US} / CPI_{domestic} = \text{constant.} \quad (3)$$

Where:

- NER is expressed in domestic currency relative to the US Dollar

Testing market real exchange rates for stationarity gives an indication as to how exchange rates and price levels behaved during the hyperinflations, and whether PPP held. Non-stationary real exchange rates indicate no obvious relationship between nominal exchange rates and relative price levels during the hyperinflationary periods.

The *a priori* expectation was that over the long-term (13 year periods under investigation), prices and exchange rates would tend to move together i.e. hyperinflationary episodes would not entail deviation from PPP (Yee-Tien Fu, 2010). The test results are presented below:

Table 1: Augmented Dickey- Fuller Test for Unit Root for Real Exchange Rates

Null Hypothesis: Unit Root present (non-stationary)

	t-Statistic	Remarks
Latin America	13.09	Accept H_0
States of the former USSR	35.35	Reject H_0
Africa	12.88	Reject H_0

Note: t-statistics are evaluated at 5% critical values

Source: Calculation by author using EViews (detailed output in Appendix section). Real exchange rate is taken to be: domestic currency/US\$*(CPI_USA/CPI_domestic).

The Augmented Dickey-Fuller test results show that PPP held in the cases of former USSR countries and Africa, i.e. the RER was constant, and movements in the RER constituted deviations from PPP. Empirically, high inflation currencies tend to exhibit long-term depreciation. In explaining the regression output for former states of the USSR, a gradual decline in productivity and output after the dissolution of the socialist bloc could have meant that the former socialist countries had to rely more on imports, hence explaining the exchange rate pass-through to domestic inflation and the sustained depreciation implied by the results.

The results also confirmed that the link between exchange rates and price levels becomes tighter during periods of high inflations. In this regard, the findings seem to agree with those of other recent studies. In an investigation of the Zimbabwean hyperinflation, Hanke (2008) acknowledges the consensus among economists that the link between exchange rates and price levels becomes tighter as inflation rates increase. Further, in examining the post-World War I German hyperinflation, Frenkel (1976) discovered that the PPP hypothesis held strongly. He points out that the temporal dimension of price arbitrage is compressed in hyperinflationary periods such that PPP holds.

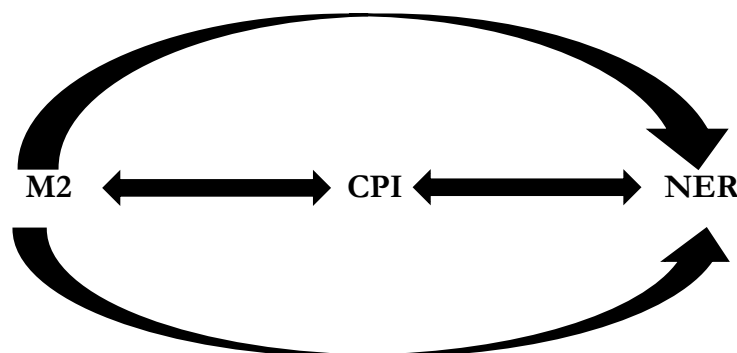
However, in the case of Latin America, the RER was non-stationary, with and without individual linear trends, implying that PPP was not satisfied during the region's hyperinflationary period. One possibility is that the exchange rates might have changed in a systematic way given the rapid changes in the price levels during the period in question. Moreover, the results suggest some

degree of nominal exchange rate misalignment which might have been borne out of efforts by monetary authorities to curb exchange rate pass-through. It is argued that in the cases of Brazil and Mexico, the respective governments tended to set the official nominal exchange rates such that real exchange rates would remain constant in the long run during the period in question (Bernanke, 2005). Another explanations could be that the exchange rates got to be distorted by currency and capital controls and restrictions which are typical in hyperinflationary environments.

In conclusion, the behaviour of exchange rates vis-à-vis inflation seem not to have been homogeneous for all the hyperinflations under investigation. The path followed by the 14 hyperinflationary episodes is then investigated by examining the relationship between inflation, money growth and exchange rate fluctuations.

B. Dumitrescu-Hurlin Panel Causality Tests

Hyperinflations tend to be self-perpetuating and thus, ‘vicious cycles’ of money growth, inflation and nominal exchange rate depreciation are expected. Causality between the variables for the three country groupings is explored to determine whether there were any similarities in the paths the hyperinflations followed.



The Dumitrescu-Hurlin panel causality test is used to explore the short run interactions between changes in the money supply (M2), nominal exchange rates (NER), the price levels (CPI), and assess whether pseudo-causality existed, guided by the quantity theory of money framework. This method is an extension of the Granger causality test as applied in the analysis of time series data, but allows all coefficients to vary across panel cross-sections (Dumitrescu and Hurlin, 2012). It therefore takes both the heterogeneity of the causal relationships and the heterogeneity of the data

generating process into account. The test assumes that lag orders K are identical for all cross-sectional units of the panel and the panel is balanced (Gujarati 2004). Coefficients are allowed to differ across countries but are assumed to be time invariant. The underlying regression is presented as:

$$Y_{i,t} = a_i + \sum \beta_{ik} y_{i,t-k} + \sum \gamma_{ik} x_{i,t-k} + \xi_{i,t} \quad (4)$$

Where:

- $x_{i,t}$ and $y_{i,t}$ are observations of two variables- for country i in period t - being tested for causality.

To determine the existence of causality, the procedure tests for significant effects of past values of x on the present values of y (Granger, 1969). Causality would imply that past values of one variable can be used to predict the change in the present values of the variable which it is estimated to Granger cause.

A Priori Expectations

The bulk of empirical literature indicates excessive money growth to be a major determinant of the rate of change in the price levels (inflation) (Strano, n.d.; Jiang, Chang and Li, 2014). Since a rapid increase in prices also gives rise to the need for additional money balances, a bidirectional causal relationship between money growth and inflation is expected. By and large, high rates of inflation typically lead to larger budget and trade deficits which require greater money creation to offset. Thus, in this sense, a clear causal relationship between money growth and inflation is expected in the three cases (Dornbusch, Sturzenegger and Wolf, 1990).

As already mentioned, earlier studies have demonstrated the presence of feedback processes between exchange rate depreciation and hyperinflations in previous studies. In consequence, some form of causality between nominal exchange rates and inflation rates is expected.

On the relationship between exchange rates and money supply, an increase in price levels is expected to lead to proportional exchange rate depreciation, under conditions where PPP holds. By the same token, for PPP to hold, exchange rate depreciations should be matched by a parallel increase in the local prices of tradable goods.

Therefore, the possible causal relationships for this analysis are as follows:

- i. Bidirectional causality between M2 and CPI; M2 and NER; CPI and NER
- ii. Unidirectional causality from: M2 to CPI; M2 to NER; CPI to NER, or vice versa
- iii. No causal relationship between the variables

Table 2: Dumitrescu-Hurlin Panel Causality Tests- Summary

	Price Level (CPI) and Nominal Exchange Rate (NER)	Money Supply (M2) and Nominal Exchange Rate (NER)	Money Supply (M2) and Price Level (CPI)
Latin America	Bidirectional	Bidirectional	Unidirectional (M2 to CPI)
States of the former USSR	Bidirectional	Bidirectional	Bidirectional
Africa	Bidirectional	No causality	No causality

Notes: Variables refer to second difference of log variables; t-statistics are evaluated at 5% critical value
: Lags: 2

The Dumitrescu-Hurlin panel causality tests were run on the identified pairs of stationary variables with two lags for each regional country panels and the results summary is shown in Table 2 above. The results are notable as the African panel is marginally different from the other two regions. The findings suggest that there was a bidirectional causal relationship between inflation and exchange rate depreciation in the three regions. For Latin America and states of the former USSR, the results suggest a bidirectional causal relationship between money supply and the exchange rate. However, this was not the case in Africa as the results suggest no causality at all between the two variables.

The relationship between money supply and inflation appears unique to each regional grouping. The findings suggest bidirectional causality in states of the former USSR, a unidirectional relationship from money supply to inflation in Latin America, and no causality in African countries. The probable explanations for the results are discussed further:

Analysis of Regional Panel Results

Table 3: Dumitrescu-Hurlin Panel Causality Tests- Latin America

Null Hypothesis:	W-Stat.	Zbar-Stat.	Prob.	Remarks (H ⁰)
CPI does not homogeneously cause NER	107.812	45.1039	0.0000	Reject
NER does not homogeneously cause CPI	12.5210	4.09718	4.E-05	Reject

Null Hypothesis:	W-Stat.	Zbar-Stat.	Prob.	Remarks (H ⁰)
NER does not homogeneously cause M2	8.96370	2.56637	0.0103	Reject
M2 does not homogeneously cause NER	16.3581	5.74841	9.E-09	Reject

Null Hypothesis:	W-Stat.	Zbar-Stat.	Prob.	Remarks (H ⁰)
M2 does not homogeneously cause CPI	5.55601	4.15168	3.E-05	Reject
CPI does not homogeneously cause M2	1.45297	0.16261	0.8708	Accept

Table 3 shows the interaction between the variables in the Latin American panel. The self-perpetuating relationship between exchange rate fluctuations, money growth, and inflation which seems to be suggested by the regression output concurs with theory and empirical evidence to a greater extent. In analysing high inflations, Dem, Mihailovici and Gao (2001) note that hyperinflations in Latin America could be largely attributed to the debt crisis experienced in the region in the 1980s. Before the crisis, the region embarked on heavy public spending drives with associated fiscal deficits. The deficits were financed through heavy borrowing and depletion of foreign reserves pre-crisis. During the debt crisis, however, these economies had to rely more on money creation to settle their debt obligations. To compound the challenge, the raising of taxes to offset such deficits was not feasible given the income levels and the volatile political dynamics of the region. The real depreciation of the exchange rates also raised the real cost of servicing international debt, providing further incentive to greater money creation.

The roles of foreign debt and exchange rates were stressed by Cardoso (1989). He argued that the experiences in Latin American countries such as Mexico, Brazil and Argentina at that time had to be interpreted in the light of their external debts. The hyperinflations started with the debt crisis, when Latin American governments were deprived of foreign capital inflows needed to finance their deficits. To produce trade surpluses and foreign exchange needed to service their debts, the countries' exchange rates were greatly depreciated. Hence, the devaluation had inflationary consequences through their impact on imported intermediate and final goods. These explanations give credence to the bidirectional causality between the nominal exchange rate and the price level suggested by this research.

Cardoso's (1989) analysis suggests that the Latin American hyperinflationary experience was a striking example for the monetarist argument. However, the findings seem to suggest that factors other than increases in money supply, at least during the initial years of the high inflation periods, were involved, particularly the debt crises due to heavy state indebtedness, unstable expectations among others, in driving price levels.

Table 4: Dumitrescu-Hurlin Panel Causality Tests- States of the former USSR

Null Hypothesis:	W-Stat.	Zbar-Stat.	Prob.	Remarks (H ⁰)
NER does not homogeneously cause CPI	15.8792	5.57382	2.E-08	Reject
CPI does not homogeneously cause NER	9.56901	2.83108	0.0046	Reject

Null Hypothesis:	W-Stat.	Zbar-Stat.	Prob.	Remarks (H ⁰)
CPI does not homogeneously cause M2	46.0528	20.2953	0.0000	Reject
M2 does not homogeneously cause CPI	430.039	201.308	0.0000	Reject

Null Hypothesis:	W-Stat.	Zbar-Stat.	Prob.	Remarks (H ⁰)
M2 does not homogeneously cause NER	204.295	87.4687	0.0000	Reject
NER does not homogeneously cause M2	51.0127	20.8446	0.0000	Reject

Table 4 presents regression results for the states of the former USSR panel. The “vicious cycle” of money growth, exchange rate depreciations and high rates of inflation during the post-Union period is quite apparent. The results suggest the presence of bidirectional causal relationships between all tested pairs. The bidirectional relationship between money supply and the price levels seems to qualify the quantity the theory of money in its basic form. In such a case, any intervention to curb ‘runaway’ inflation requires the constriction of money growth.

Various studies emphasise the complexity of the hyperinflations witnessed in these former socialist countries as they transitioned to a new economic order. Dem, Mihailovici and Gao (2001) identify administrated prices (price controls) and the associated excess demand, social transfer systems and quasi-fiscal deficits, which inherently typified the former USSR, as the root causes of persistently high inflations which became the launch-pad for the subsequent hyperinflations. Rather than neutralising fiscal deficits, the governments allowed them to be monetised whilst there was no real growth of the economies. The result was excessive money supply growth. It was coupled with lack of access to foreign capital due to embargoes and economic sanctions imposed by international bodies and countries opposed to the then prevailing regional political and economic models. This resulted in the economic challenges such as currency value free-falls and high inflation during this period.

Table 5: Dumitrescu-Hurlin Panel Causality Tests- Africa

Null Hypothesis:	W-Stat.	Zbar-Stat.	Prob.	Remarks (H ⁰)
CPI does not homogeneously cause NER	11.7150	2.46604	0.0137	Reject
NER does not homogeneously cause CPI	10.1503	2.01758	0.0436	Reject

Null Hypothesis:	W-Stat.	Zbar-Stat.	Prob.	Remarks (H ⁰)
M2 does not homogeneously cause CPI	2.16672	-0.27068	0.7866	Accept
CPI does not homogeneously cause M2	8.06106	1.41875	0.1560	Accept

Null Hypothesis:	W-Stat.	Zbar-Stat.	Prob.	Remarks (H ⁰)
M2 does not homogeneously cause NER	1.24636	-0.53447	0.5930	Accept
NER does not homogeneously cause M2	8.46252	1.53381	0.1251	Accept

In the case of the panel comprising of the three African countries as presented in Table 5, the results were unexpected. For instance, there seemed to be no causal relationship between money supply and price levels. The expectation was that given evidence of high levels of money growth to finance unbudgeted expenditures and to also keep up with the demand for money during the hyperinflationary episodes in the three countries, the relationship between money growth and inflation would be apparent. The results also seem to be inconsistent with the monetarist view that rapid money growth is to blame for high rates of inflation.

However, the indication of the presence of a bidirectional causal relationship between exchange rate depreciation and inflation was expected. The results concur with the findings by Bueugrand (1997) in Zaire (presently DRC) where the Zaire exchange rate and consumer prices were seen to move in close relationship during the hyperinflationary period. Bueugrand recounts that during the hyperinflation years in that country, inflation and the rate of currency depreciation were highly volatile. There was evidence of “sudden and rapid” currency depreciation whenever new banknotes were dispatched by the Central Bank, or even when impending money supplies were expected (Bueugrand, 1997; 6). As was the case in other experiences, a real depreciation of domestic currencies was an automatic source of inflation.

Velocity of money dynamics for each country grouping during the hyperinflationary periods was examined.

C. Velocity of Money and Hyperinflations

The relationship between inflation and velocity of money within the three panels is examined to make deductions as to whether the response of velocity to hyperinflation is homogeneous within and between the regions given their diverse inflationary experiences. The premise of the

investigation is the quantity of money theory (QTM). The quantity of money equation of exchange identifies the mathematical relationship between the variables to take the form:

$$MV=PQ \quad (5)$$

The equation can thus be used to form a basic theory of inflation such that: $P=MV/Q$

- where M is money supply
- V is the velocity of money- defined as being equal to the income as valued monetarily and output divided by the money stock
- P is the general price level, and;
- Q is nominal income, a subset of total transactions. The economy-wide monetary value of all transactions is generally difficult to measure, especially in developing economies, thus could not be used.

Rather than assuming that money velocity or its growth rate is constant, the QTM equation can be used to allow the changes in velocity to be determined directly by three sources: inflation, growth in output, as well as money growth by taking the time derivatives of the identified variables such that the final equation takes the following form:

$$m + v = p + q \quad (6)$$

As velocity is being tested, it is made the subject of the formula wherein:

$$v = p + q - m \quad (7)$$

From equation (5), velocity is calculated by dividing nominal GDP in local currencies with broad money, such that:

$$V = PQ/M2 \quad (8)$$

The interaction between velocity and current and lagged inflation rates is explored in particular, in order to encompass the role of expectations and adjustments over time in hyperinflationary environments (Hansel and Vogel 1973). The regression thus takes the form of:

$$V = a + Infl + Infl_{.1} + Infl_{.2} + \pi \quad (9)$$

Where the dependent variable, V , is velocity of money, defined by Okafor et al (2013) as “a measure of the rate of the use of money or the average number of transactions per unit of money.” It is a measurable flow concept. Inflation is measured by the annual percentage change in the CPI.

The omission of explanatory variables used in some studies especially in advanced economies, such as interest rates, is not expected to result in any form of bias (Hanson and Vogel, 1973). Dummy variables were employed in an effort to capture variations between individual countries and time effects. To capture time effects, dummy variables were created such that 1 = inflation rates greater than or equal to 100% whereas 0 = less than 100%; to identify hyper from chronic inflation. As there are instances of fluctuations and oscillations of the inflation rates within the periods under investigation, this ensures that clear distinctions between years with hyper and normal inflation, falling within the hyperinflationary epochs are made.

Also, the fixed effects model is applied to ensure individual country intercepts do not vary over time (Gujarati 2004; 648). Differential intercept dummies (D) are employed as illustrated:

$$Y_{it} = a_1 + a_2D_{2i} + a_3D_{3i} + a_4D_{4i} + \beta_2X_{2it} + \beta_3X_{3it} + u_{it}; \quad (10)$$

(Where $D_{2i} = 1$ for the first country, and 0 otherwise)

To expand on velocity, the dependent variable- it is largely a function of people's preferences, real factors and societal structure (Fischer, 2002). It tends to be independent of government policies especially demand management policies, and is influenced mainly by the following factors:

- i Monetary base-** if the money supply is less than its requirements for transactions by economic agents, velocity of money is expected to increase.
- ii The market value of money-** ceteris paribus, a fall in the value of money is expected to lead to a rise in velocity. Velocity is expected to be high during hyperinflationary periods as individuals and firms would want to dispose of their cash balances and hedge against losses before the money at hand loses value. Thus, expectation is that velocity would be high for the three regions during the periods under investigation.
- iii Frequency of transactions-** with the increase in the frequency of transactions, typical of inflationary periods, the number of payments and receipt are expected to increase thus velocity.

iv **Real output**- *ceteris paribus*, an increase in real output within an economy would result in a spike in velocity. With more activity in an economy, each unit of base money needs to circulate more times. However, as most countries tend to be on relative or full-blown crisis mode during periods of hyperinflation, real output growth in most instances stagnates or even falls.

***A priori* Expectations**

Velocity of money critically depends upon the value of money. Therefore, with the market value of money plummeting, typical of periods of high inflation, velocity is expected to rise. Selden (1956) states that “the importance of the velocity of money concept can scarcely be denied as a given change in the quantity of money has widely varying effects on price levels and output, depending on the behaviour of monetary velocity.”

Previous work on the impact of high inflation on velocity have revealed mixed results. Bueugrand (1997;2) points out that throughout the 1980s to 1990s, the velocity of money in Congo was higher than the norm, which testified to the widespread use of foreign currency such as the US Dollar and Belgian Francs for domestic transactions. He notes that velocity increased “extraordinarily” during the early days of the hyperinflation. Also, during the hyperinflations in Latin America, a combination of forces led to the “dramatic” rise in velocity owing to a “flight from money” in the high inflation countries (Dornbusch and Wolf, 1990; 24). On the other hand, Meiselman (1970) found little evidence to conclude that there was a positive relationship between inflation and velocity in the several low-income economies he investigated³. Work by Malitz and Correa (1970) also suggested that price changes have no significant impact on velocity except in cases of hyperinflation. For this investigation, the results would enable inferences to be made as to whether velocity tends to be constant and predictable during hyperinflations, and whether it is a function of current and lagged inflation.

Empirical Results

Tables 6 to 8 report the results from the velocity, current and lagged inflation regressions using three methods; one simple regression without dummy variables, and with the second introducing

³ The identified studies used monthly data.

year dummy variables (where 1 = years when inflation rate was greater than 100% and 0 = less than 100%). The third regression introduced country dummies in an attempt to account for variations between countries within panels.

Table 6: Velocity and Inflation- Latin America

V:M2	Intercept	Inflation	Inflation _{t-1}	Inflation _{t-2}	R ²
Panel	4.483491	0.000124 (0.84)	0.000391 (2.61)	0.000124 (0.9)	0.168
Panel with year dummies	4.553140	0.000132 (0.86)	0.000399 (2.54)	0.000124 (0.9)	0.169
Panel with country dummies	3.459417	0.000171 (1.26)	0.000416 (3.04)	0.000156 (1.14)	0.375

Note: Estimated coefficients are given with coefficients in parentheses underneath.

Table 7: Velocity and Inflation- States of the former USSR

V:M2	Intercept	Inflation	Inflation _{t-1}	Inflation _{t-2}	R ²
Panel	5.611229	0.001766 (-3.29)	0.000613 (1.07)	0.001850 (3.67)	0.316
Panel with year dummies	5.848424	-0.001263 (-2.12)	0.001130 (1.79)	0.001674 (3.32)	0.351
Panel with country dummies	4.471647	-0.002034 (-5.26)	0.000386 (0.93)	0.001454 (3.94)	0.679

Note: Estimated coefficients are given with coefficients in parentheses underneath.

Table 8: Velocity and Inflation- Africa

V:M2	Intercept	Inflation	Inflation _{t-1}	Inflation _{t-2}	R ²
Panel	35.96839	9.61E-12 (20.99)	0.000281 (0.05)	-0.001071 (-0.18)	0.951
Panel with year dummies	3.272536	9.60E-12 (20.75)	-0.000222 (-0.04)	-0.001537 (-0.26)	0.95
Panel with country dummies	8.008807	9.35E-12 (19.5)	0.002188 (0.37)	0.000930 (0.16)	0.95

Note: Estimated coefficients are given with coefficients in parentheses underneath.

The results indicate that the regressions without dummy variables have virtually minimal explanatory power, with R² for the states of the former USSR and Latin American panels being less than 0.3%. However, the introduction of country dummy variables gave a boost to the explanatory power of the regressions and marginally increased the significance of the coefficients.

Although inflation seems to be significant in explaining velocity in the three cases, the elasticity of velocity with respect to inflation is quite low. However, as these are point rather than constant elasticities, as the study analyses panel data, the reality is that the relationship between inflation and velocity varies greatly from one country to another. Hanson and Vogel (1973), in their study of inflation and monetary velocity in Latin America, attributed low estimated elasticities to data

imperfections and the apparent challenge of measuring inflationary expectation, especially in developing country settings. The lack of adequate hedges against inflation (alternative assets that can be held in the face of a fast depreciating local currency) which is characteristic of developing countries could also be an explanation for the low coefficients. The low elasticities could also be evidence that economic agents could not escape the erosion of their real balances by switching to other forms of assets (Owoye, 1997).

Despite the substantial dissimilarities in inflation rates and velocity in the countries, there seems not to be significant differences in the impact of hyperinflation on velocity. This agrees with findings by Melitz and Correa (1970) in a cross-section of 51 countries. Similarly, Zholood (2001) also found inflation to be insignificant in explaining the behaviour of velocity in Ukraine during its period of high inflation rates in the 1990s. The seemingly unresponsive velocities could be attributed to their relationship with GDPs, which were shrinking in most of the countries during the hyperinflationary periods. However, as money demand is not only influenced by the purchase of final output, but by total transactions, the income velocity was expected to be lower as compared to transactions velocity but indicative nonetheless.

Lastly, the long-run relationship between inflation, money growth and real output during hyperinflations was examined by employing co-integration tests.

D. Panel Co-integration Tests

The Pedroni Residual Co-integration test was applied with automatic lag selection to examine if there was any long-run or equilibrium relationship between money growth, inflation and real output during the hyperinflationary periods. The test considers the time series panel regression as follows:

$$Y_{it} = \alpha_i + \delta_i + X_{it}'\gamma_i + e_{it} \quad (11)$$

Where:

- Y_{it} and X_{it} are observable variables taking the dimension of $(N \times T) \times 1$ and $(N \times T) \times M$.
- α_i are taken to be individual fixed effects and δ_i are individual time trends (country-specific deterministic trend effects).

- γ_i (the vector of the slope coefficients) varies from country to country, and e_{it} is the error term.

The null hypothesis of the test is no co-integration (weighted at 5% level of significance). The test allows the use of unbalanced panels and for heterogeneity in the long-term co-integrating vectors. It consists of 11 statistics grouped into two parts; with the first part based on the within dimension approach- with the panels v , ρ , PP and ADF statistics. The second part, on the other hand, is based on the between-dimension approach, and consists of Group ρ , PP and ADF statistics.

The general equation of exchange is presented in log form as follows:

$$\ln \text{CPI} = \ln \text{M2} - \ln \text{RGDP} \quad (12)$$

The independent variables presented in equation 12 are considered to be determinants of the price level in the long-run. Hence, if QTM holds in the three instances, the price level should be co-integrated with money growth and real output. Velocity is not included in the regression as per the standard equation of exchange because it is assumed to be neutral in the long-run.

***A priori* Expectation**

The a priori expectation is that there exists a long-run relationship between $\ln \text{M2}$, $\ln \text{RGDP}$ and $\ln \text{CPI}$ for the three country panels, consistent with theory. The results summary tables are presented below:

Empirical Results

Table 9: Estimation of the Long Run Relationship- Latin America

	Statistic	Prob.	Remarks (H ₀)	Statistic	Prob.	Remarks (H ₀)
Panel v-Statistic	11.74737	0.0000	Reject	6.211187	0.0000	Reject
Panel rho-Statistic	1.738966	0.9590	Accept	-0.127349	0.4493	Accept
Panel PP-Statistic	0.493699	0.6892	Accept	-12.13272	0.0000	Reject
Panel ADF-Statistic	0.558986	0.7119	Accept	-6.728554	0.0000	Reject

	Statistic	Prob.	Remarks (H ₀)
Group rho-Statistic	1.238239	0.8922	Accept
Group PP-Statistic	-15.24887	0.0000	Reject
Group ADF-Statistic	-6.790194	0.0000	Reject

Note: weighted at 5% level of significance; automatic lags

Table 10: Estimation of the Long Run Relationship- States of the former USSR

	<u>Statistic</u>	<u>Prob.</u>	<u>Remarks</u>	<u>Statistic</u>	<u>Prob.</u>	<u>Remarks (H⁰)</u>
Panel v-Statistic	2.708785	0.0034	Reject	2.054896	0.0199	Reject
Panel rho-Statistic	1.399391	0.9192	Accept	1.450837	0.9266	Accept
Panel PP-Statistic	-2.244061	0.0124	Reject	-0.863342	0.1940	Accept
Panel ADF-Statistic	-3.378985	0.0004	Reject	-1.978426	0.0239	Reject

	<u>Statistic</u>	<u>Prob.</u>	<u>Remarks (H⁰)</u>
Group rho-Statistic	2.370146	0.9911	Accept
Group PP-Statistic	-1.357959	0.0872	Accept
Group ADF-Statistic	-1.293800	0.0979	Accept

Note: weighted at 5% level of significance; automatic lags

Table 11: Estimation of the Long Run Relationship- Africa

	<u>Statistic</u>	<u>Prob.</u>	<u>Statistic</u>	<u>Prob.</u>	<u>Remarks (H⁰)</u>
Panel v-Statistic	-0.810090	0.7911	-0.506912	0.6939	Accept
Panel rho-Statistic	1.219276	0.8886	1.137486	0.8723	Accept
Panel PP-Statistic	0.146524	0.5582	0.003538	0.5014	Accept
Panel ADF-Statistic	0.315092	0.6237	0.188596	0.5748	Accept

	<u>Statistic</u>	<u>Prob.</u>	<u>Remarks (H⁰)</u>
Group rho-Statistic	1.796099	0.9638	Accept
Group PP-Statistic	-0.043914	0.4825	Accept
Group ADF-Statistic	0.418381	0.6622	Accept

Note: weighted at 5% level of significance; automatic lags

Tables 9 to 11 present results of regressing the price levels on money supply and real output for each regional panel. The results were expected to show evidence of a long-run co-integrating relationship between money growth, inflation and real output, consistent with theory in the three cases. However, the probability values suggest that the *a priori* expectation only held in the Latin American case, at 5% level of significance. In the case of the former states of the USSR, a co-integrating relationship would only hold at 10% level of significance; not at 5%. The results suggest the absence of a long-run relationship between the variables during the hyperinflations in Africa.

The Latin American and former states of the USSR findings concur with the QTM, which points out to the proportionate movement of price levels and money supply changes, especially in high inflation countries.

However, in the case of the African panel, the results seem to indicate that there was no long-run relationship between the variables. In a similar study in the United States for the period 1959 to 2004, Miyao (1996) could also not find a long-run relationship between price levels, money supply, output and interest rates. These findings could be due to likely caveats: the hyperinflationary

periods examined, of 13 years per country- which might be considered to be rather short. Also, the fluctuations of variables, which tend to be somewhat erratic during hyperinflations, could present structural breaks which might have affected the regression output (Breitwieser and Khalil, 2012).

4.0 CONCLUSION

The primary focus of the paper was to assess the nature of hyperinflations which occurred between the years 1980 and 2008, with the aim of determining whether they followed similar trajectories. The study examined hyperinflations in 14 developing and transitional economies, grouped into three geo-political regions of Latin America, former states of the USSR and Africa.

4.1 Summary and Conclusions

In analysing the hyperinflations, the relationship between money supply, exchange rates and price levels during the periods was examined using Dumitrescu-Hurlin panel causality tests. The primary empirical findings from the causality tests suggested the presence of a dynamic relationship, a 'vicious cycle', between exchange rate depreciation, money growth and inflations in the case of two regions of Latin America and states of the former USSR. Findings in the African panel were marginally different, however. This would suggest that during hyperinflations, the interaction between exchange rates, money supply and price levels is unique to each experience and largely differs on a case-by-case basis. The interaction between the identified variables ought not to be assumed to be identical in all periods of high inflation.

Using the PPP hypothesis framework, the money growth-inflation-depreciation spiral was analysed. Exchange rates in the three panels were tested for stationarity and findings indicated that PPP only held in the cases of former states of the USSR and Africa. In Latin America, there seemed to have been no long-run relationship between exchange rate fluctuations and the upward spiralling price levels during the hyperinflations. However, depreciation of exchange rates evidently played a significant role in the hyperinflationary dynamics experienced in the three regions. Although PPP theory suggests that the hypothesis is likely to hold well in countries experiencing high rates of inflation, the deduction from the results is that this might not strictly be the case for all hyperinflationary episodes.

Using the quantity theory of money framework, this study further examined if some form of equilibrium or long-run relationship existed between inflation, money growth and real output during the 13 year hyperinflationary periods. The Pedroni Residual Co-integration tests provided

mixed findings. There was evidence of a long-run relationship between the variables in Latin America and former states of the USSR, albeit not in the case of Africa.

Although there are notable similarities especially regarding the causal relationships between money supply, exchange rates and price levels, which largely corroborates with theory and empirical evidence from other countries, the indication is that the trajectory of hyperinflations tend to exhibit temporal and spatial variations. Therefore, policymakers ought to be mindful of the underlying country or regional-specific drivers and characteristics, to prevent their persistence.

Overall, the results show that hyperinflationary experiences, although outwardly similar, do not necessarily follow identical paths upon closer scrutiny.

4.2 Limitations of Research

The main limitation to the analysis was data availability. The unavailability of reliable data is always an expected challenge when dealing with ‘unique’ economic phenomena such as hyperinflations. Therefore, datasets especially for the African and former states of the USSR panels had to be obtained from various sources; which might have posed a consistency challenge. Also, some countries which experienced hyperinflations within the period under study had to be left out because of data unavailability.

4.3 Directions for Further Research

Further research could consider examining these recent hyperinflations through individual country comparisons by way of cross-section data analysis. By its very nature, panel data analysis would give ‘averages’ of the cross-sections, which might not provide definitive reflections of the variations and unique country-specific traits. Hence, as this study grouped countries according to geo-political regions, intra-regional variations cannot be ruled out.

Reference List

- Ahmed, E. & Suliman, Z. 2011. Modelling Stock Market Volatility Using GARCH Models Evidence from Sudan. *International Journal of Business and Social Science*, December, 2(23)
- Aisen, A & Veiga, J. 2005. Does Political Instability Lead to Higher Inflation? A Panel Data Analysis. *IMF Working Paper* WP/05/49, International Monetary Fund.
- Akinbobola, T. 2012. The Dynamics of Money Supply, Exchange Rates and Inflation in Nigeria. *Journal of Applied Finance & Banking*, Vol.2, No.4, 2012, 117-141
- Alba, J & Papell, D. 2007. Purchasing Power Parity and Country Characteristics: Evidence from Panel Data Tests. *Journal of Development Economics*, Vol.83 (1), pp. 240-251
- Al-Gasaymeh, A & Kasem, J. 2015. Strong and Weak Form of Purchasing Power Parity: The Case of Jordan and its Major Trading Partners. *Journal of International Business and Economics*. Vol. 3 (1a)
- Asekunowo, V. 2016. The Causes of Persistent Inflation in Nigeria. *CBN Journal of Applied Statistics*, Vol. 7 No. 2
- Asteriou, D. & Hall, S. 2011. *Applied econometrics*. Palgrave Macmillan, New York.
- Barugahara, F. 2014. The Impact of Political Instability on Inflation Volatility in Africa. *South African Journal of Economics*. Volume 83(1): 56-73
- Beaugrand, P. 1997. Zaire's Hyperinflation, 1990–96, *IMF Working Paper* WP/97/50, International Monetary Fund.
- Bernanke, B. 2005. Inflation in Latin America: A New Era? [Lecture] Remarks at the Stanford Institute for Economic Research Summit, Stanford: California
- Bernholz, P. 1995. 'Hyperinflation and Currency Reform in Bolivia: Studied from a General Perspective' in Siklos P L (Ed) *Great Inflations of the 20th Century: Theories, Policies and Evidence*. Edward Elgar Publishing Limited: UK.
- Beltas, A & Jones, T. 1993. "Money, Inflation and Causality in a Financially Repressed Economy, Algeria, 1970–88". *Applied Economics*, 25, pp. 473–480.
- Breitwieser, A & Khalil, M. 2012. *Does the Quantity Theory of Money hold for the Euro Area?* Available: univie.ac.at/robert.kunst/tser11
- Bruno, M. 1991. High Inflation and the Nominal Anchors of an Open Economy. *Essays in International Finance*, No. 183.
- Cagan, P. 1956. 'The Monetary Dynamics of Hyperinflation' in Friedman M (Ed) *Studies in the Quantity Theory of Money*: University of Chicago Press.
- Carlson, M. 2013. *Determinants of Hyperinflation: Case Studies from Latin America*. The College of New Jersey: New Jersey

- Calvo, G & Reinhart C. 1994. Targeting the Real Exchange Rate: Theory and Evidence, *Journal of Development Economics* 47(1), 97-133.
- Cassel, K. 1921. *The World's Money Problems*. Macmillan: New York
- Canetti, E. 1991. Monetary Growth and Exchange Rate Depreciation as Causes of Inflation in African Countries: An Empirical Analysis (July 1991). *IMF Working Paper*, Vol., pp. 1-49 Available at SSRN: <https://ssrn.com/abstract=884924>
- Capie, F. & Wood, G. 1986. Central Banks Can Avert Disaster. *Economic Affairs*, 7: 57–58. Available: doi:10.1111/j.1468-0270.1986.tb01813.x
- Cardoso, E. 1991. "From Inertia to Mega inflation: Brazil in the 1980s," *NBER Working Papers* 3585, National Bureau of Economic Research, Massachusetts
- Cheng, M & Tan, H. 2014. Inflation in Malaysia. *International Journal of Social Economics*, Vol. 29 Issue: 5, pp.411-425
- Chhibber, A & Shafik, N. 1990. *Exchange Reform, Parallel Markets and Inflation in Africa: The Case of Ghana*, *World Bank Working Paper, WPS 427*, World Bank, Washington DC.
- Choudhry, T. 1995. High Inflation Rates and the Long-run Money Demand Function: Evidence from Co-integration Tests. *Journal of Macroeconomics*, 17.
- Coomer, J. 2014. Zimbabwe's Economic Crisis and Hyperinflation: 1997-2009. Master's Thesis; University of Cape Town, South Africa
- Darrat, A. 1986. Trade and Development: The Asian Experience. *Cato Journal*, Vol. 6, Issue 2, 695-699
- Deniz, P.; Tekce, M. & Yilmaz, A. 2016. Investigating the Determinants of Inflation: A Panel Data Analysis; *International Journal of Financial Research*, Vol. 7, No. 2
- Dornbusch, R. 1986. Inflation, Exchange Rates and Stabilisation. *Essays in International Finance* No. 165. Princeton University, New Jersey
- Dornbusch, R., Sturzenegger, F & Wolf, H. 1990. Extreme Inflation: Dynamics and Stabilisation; *Brookings Paper on Economic Activity*
- Durevall, D & Ndungu- Njuguna, S. 1999. A Dynamic Model of Inflation for Kenya 1974–1996, IMF Working paper WP/99/97, International Monetary Fund, Washington, DC.
- Edwards, S. 1994. The Political Economy of Inflation and Stabilization in Developing Countries, *Economic Development and Cultural Change* 42, no. 2: 235-266.
- Ellyne, M & Daly, M. 2014. Zimbabwe Monetary Policy 1998-2012: From Hyperinflation to Dollarisation. *Economic Management under Hyperinflationary Environment: Lessons from Zimbabwe*, Oxford University Press.

- Engle, R. & Granger, C. 1987. Co-Integration and Error Correction: Representation, Estimation and Testing, *Econometrica* 55 (2): 251 - 276.
- Fergusson, A. 2010. *When Money Dies: The Nightmare of Deficit Spending, Devaluation, and Hyperinflation in Weimar Germany*. London.
- Filatoshv & Bradshaw, M. 1992. *Industrial Restructuring and Soviet Regional Development*. Belhaven Press: London.
- Fischer, S. 1994. Russia and the Soviet Union Then and Now. In *The Transition in Eastern Europe - Country Studies* (pp. 221-257).
- Fischer, S. 1982. Seigniorage and the Case for a National Money. *Journal of Political Economy*, 90 (2).
- Fischer, S., & Easterly, W. 1990. The Economics of the Government Budget Constraint. *The World Bank Research Observer*, Vol. 5, No. 2, 127-142.
- Fischer, S., Sahay, R., & Végh, C. 2002. Modern Hyper- and High Inflation. *IMF Working Paper WP/02/197* [corrected: 1/31/03]. International Monetary Fund - Research Department.
- Frenkel, J. A. 1976. A Monetary Approach to the Exchange Rate: Doctrinal Aspects and Empirical Evidence. *Scandinavian Journal of Economics*. Vol. 78, pp. 200-224.
- Friedman, M & Schwartz, A. 1963. *A Monetary History of the United States, 1867-1960*. Princeton University Press: New Jersey
- Friedman, M. (1992), *Money Mischief*, Harcourt Brace Jovanovich, New York.
- Ghatak, S. 1995. *Monetary Economics in Developing Countries*. St Martin's Press: London.
- Granger, C. 1969. Investigating Causal Relations by Econometric Models and Cross Spectral Methods, *Econometrica*, Vol. 37,
- Hanson, J. & Vogel, R. 1973. Inflation and Monetary Velocity in Latin America. *The Review of Economics and Statistics*, vol. 55, issue 3
- Hanke, S. 2008. Zimbabwe: From Hyperinflation to Growth. Development Policy Analysis No. 6. *The Cato Institute, Centre for Global Liberty and Prosperity*, Washington, D.C
- Hanke, S & Krus, N. 2012. World Hyperinflations. *Institute for Applied Economics, Global Health, and the Study of Business Enterprise*. The Johns Hopkins University: Baltimore
- Hurlin, C. & Dumitrescu, E. 2012. Testing for Granger Non-causality in Heterogeneous Panels. Available at [<halshs-00224434v2>](#)
- Humphrey, T. 2004. Alfred Marshall and the Quantity Theory of Money. *Federal Reserve Bank of Richmond*; Working paper no. 04-10.
- Holod, D. 2000. The Relationship between Price Level, Money Supply and Exchange Rate in Ukraine. PhD Thesis, National University of Kiev
- International Monetary Fund (IMF). 1996. Zaire-Background Information and Statistical Data. *IMF Staff Country Report No. 96/28*, Washington, DC.

- Ito, T. & Sato, K. 2007. Exchange rate pass-through and domestic inflation: A comparison between East Asia and Latin American countries. *REITI Discussion Paper Series* No. 07-E-040
- Joplin, T. 1826. *Views on the Subject of Corn and Currency*. Newcastle-on-Tyne
- Kamin, B.S. & Klau, M. 1997. *Some Multi-Country Evidence of the Effects of Real Exchange Rates on Output*. Bank for International Settlements, BASLE
- Lahiri, A. 1991. Yugoslav Inflation and Money. *IMF Working Paper*, Vol.1, pp. 1-46.
- Latin American Inflation. (1998). *The Economist*, [online] p.1. Available at: <https://www.economist.com/emerging-market-indicators/1998/11/05/latin-american-inflation> [Accessed 30 Jul. 2017].
- Laughlin, J. L. 1909. Gold and Prices. *Journal of Political Economy*, vol. 17, pp. 257–71.
- Maswana, J. C. 2006. Granger Non-Causality Test of the Inflation-Exchange Rate in the Democratic Republic of Congo. *Congo Economic Review*, Working Paper 03/06
- Mandizha, B. 2014. Inflation and Exchange Rate Depreciation: A Granger Causality Test at the Naissance of Zimbabwe's Infamous Hyperinflation (2001-2005). *Economics and Finance Review* Vol. 3(09) pp. 22 – 42
- Makochekanwa, A. 2007. A Dynamic Enquiry into the Causes of Hyperinflation in Zimbabwe. *Department of Economics Working Paper Series*. University of Pretoria
- Makochekwana, A. 2007. *Zimbabwe's Black Market for Foreign Exchange*. University of Pretoria: Pretoria, South Africa
- Makinen, E & Woodward, T. 1989. The Taiwanese Hyperinflation and Stabilisation of 1945-52; *Journal of Money, Credit and Banking*, Vol. 21
- Makinen, G. 2014. *Studies in Hyperinflation and Stabilisation*. Centre for Financial Stability. New York
- Meiselman, D. 1970. *Varieties of Monetary Experience*. University of Chicago Press: Chicago
- Melitz, J & Correa, H. 1970. International Differences in Income Velocity. *The Review of Economic Statistics*, vol. 52, issue 1, 12-17
- Mei-Se, C; Chien-Chiang, L & Sin-Jie, C. 2014. A Panel Co-integration Analysis for Macroeconomic Determinants of International Housing Market. World Academy of Science, Engineering and Technology; *International Journal of Economics and Management Engineering*. Vol. 8, No: 7
- Ming-Yu, C. & Hui-Boon, T. 2002. Inflation in Malaysia. *International Journal of Social Economics*, Vol. 29 Issue: 5, pp.411-425, <https://doi.org/10.1108/03068290210423532>
- Mishkin, F. 2001. *The Economics of Money, Banking, and Financial Markets*, 6th ed. Library of Congress: Cataloguing-in-Publication data, USA.
- Miyao, R. 1996. Does a Co-integrating M2 Demand Relation Really Exist in the United States? *Journal of Money, Credit, and Banking* 28 (3), 365-380.

- Morales, J. & Sachs, J. 1989. 'Bolivia's Economic Crisis' in J Sachs (ed.) Developing Country Debt and Economic Performance. University of Chicago Press: Chicago
- Omotor, D. 2008. *Exchange Rate Reform and Its Inflationary Consequences: The Case of Nigeria*. Delta State University: Abraka, Nigeria
- Owoye, O. 1997. Income Velocity and the Variability of Money Growth: Evidence from Less Developed Countries. *Econpapers: Applied Economics*. 1997, Vol. 29, Issue 4
- Pazos, F. 1972. *Chronic Inflation in Latin America*. Praeger Publishers: New York
- Pinga, V & Nelson, G. 2001. Money, Prices and Causality: Monetarist versus Structuralist Explanations using Pooled Country Evidence. *Applied Economics*, 2001, Vol. 33, Issue 10, 1271-1281
- Reinhart, C.; Kenneth, S. & Savastano, M. 2003. "Debt Intolerance," *Brookings Papers on Economic Activity*, 34, 2003-1
- Samimi, A & Kenari, S. 2015. "Inflation and Economic Growth in Developing Countries: New Evidence," *International Journal of Economics and Empirical Research (IJEER)*, The Economics and Social Development Organization (TESDO), vol. 3(2), pages 51-56
- Sanusi, A. 2010. Exchange Rate Pass-through to Consumer Prices in Ghana: Evidence from Structural Vector Auto regression. *Journal of Monetary and Economic Integration*. Vol.10 (1).
- Selden, R. 1956. Monetary Velocity in the United States; in *Studies in the Quantity Theory of Money* ed M. Friedman. Chicago: University of Chicago Press. pp 179-257
- Strano, A. n.d. How and how much can the money supply affect the inflation rate? *Journal of Economic Literature*. Available: <https://www.ukdataservice.ac.uk/media/263125/strano-paper.pdf>
- Syrotian, R. 2012. Velocity of Money: Determinants in Ukraine. Master's Thesis; Kyiv School of Economics, Ukraine
- Takatoshi, I. & Kiyotaka, S. 2007. Exchange Rate Pass-Through and Domestic Inflation: A comparison between East Asia and Latin American countries; *Discussion papers, Research Institute of Economy, Trade and Industry (RIETI)*
- Taylor, A. & Taylor, M. 2004. The Purchasing Power Parity Debate. *Journal of Economic Perspectives*, 2004, v18, 135-158
- Totonchi, J .2011. *Macroeconomic Theories of Inflation*. International Conference on Economics and Finance Research, IACSIT Press: Singapore
- Waingade, A. 2011. Money Supply and Inflation: A Historical Analysis. *The IUP Journal of Monetary Economics*, Vol. 9 (1).
- World Bank. 2016. World Development Indicators. Available: data.worldbank.org/wdi

Yee- Tien, F. 2011. International Investments Hand-out. [Lecture notes]. Available:
web.stanford.edu/class/

Zholood, O. 2001. Volatility of Velocity in Transitional Economies: Case of Ukraine. MA Thesis.
Ukraine University

APPENDIX

Table A1: Latin America Data Used in the Panel Econometric Analysis

COUNTRY		CPI=100	M2	RER	NER	RGDP US\$	Velocity	INFL
Argentina	1980	0	958.4	0.006942	1.84E-08	2.26E+11	4.341611	100.8
Argentina	1981	0	1921.15	0.018353	4.4E-08	2.13E+11	4.216225	104.5
Argentina	1982	0	4593.3	0.11472	2.59E-07	2.03E+11	5.155553	164.8
Argentina	1983	0	23021.3	0.480971	1.05E-06	2.11E+11	5.154618	343.8
Argentina	1984	0.0001	173802.9	3.223374	6.76E-06	2.15E+11	4.931604	626.7
Argentina	1985	0.001	917943.4	2.969641	6.02E-05	1.99E+11	6.262996	672.2
Argentina	1986	0.002	1955360	2.369953	9.43E-05	2.15E+11	5.533436	90.1
Argentina	1987	0.0048	5145383	2.329364	0.000214	2.21E+11	4.914197	131.3
Argentina	1988	0.02	27929434	2.373406	0.000875	2.15E+11	4.309392	343
Argentina	1989	0.637	6.52E+08	3.778221	0.042334	1.99E+11	5.392026	3079.8
Argentina	1990	15.38	7.91E+09	1.899624	0.487589	1.94E+11	9.442691	2314
Argentina	1991	41.78	1.91E+10	1.425478	0.953554	2.19E+11	10.26392	171.7
Argentina	1992	52.18	3.10E+10	1.221672	0.990642	2.45E+11	7.922878	24.9
Bolivia	1980	0.000215	23124	4.310694	2.45E-05	9.2E+09	5.319149	47.2
Bolivia	1981	0.000284	29417.7	3.598901	2.45E-05	9.23E+09	5.268937	32.1
Bolivia	1982	0.000635	97201.2	4.466143	6.41E-05	8.86E+09	4.135751	123.5
Bolivia	1983	0.002385	265116	4.436938	0.000232	8.51E+09	5.518339	275.6
Bolivia	1984	0.032939	4053400	4.53633	0.003136	8.49E+09	5.729511	1281.3
Bolivia	1985	3.903126	2.87E+08	5.563063	0.440029	8.35E+09	9.988533	11749.6
Bolivia	1986	14.68887	8.17E+08	6.576567	1.921958	8.13E+09	10.923	276.3
Bolivia	1987	16.83031	1.59E+09	6.366217	2.05485	8.33E+09	6.401258	14.6
Bolivia	1988	19.52351	2.04E+09	6.528588	2.350242	8.57E+09	5.296814	16
Bolivia	1989	22.48591	2.47E+09	6.805365	2.691683	8.9E+09	5.139233	15.2
Bolivia	1990	26.33522	3.78E+09	7.218639	3.17265	9.31E+09	4.085486	17.1
Bolivia	1991	25.15128	5.70E+09	8.891607	3.580608	9.8E+09	3.356514	21.4
Bolivia	1992	35.84065	7.66E+09	7.003071	3.900517	9.96E+09	2.87389	12.1
Brazil	1982	1.45E-09	1.853091	2.024565	7.77E-11	1.01E+12	10.0103	100.5
Brazil	1983	3.4E-09	4.369818	3.061738	2.5E-10	9.66E+11	9.737248	135

Brazil	1984	9.92E-09	16.17382	3.567781	8E-10	9.72E+11	8.678222	192.1
Brazil	1985	3.23E-08	68.32909	3.794457	2.68E-09	9.38E+11	7.360116	226
Brazil	1986	7.99E-08	265.9447	3.524243	5.91E-09	9.88E+11	5.007206	147.1
Brazil	1987	2.62E-07	834.1833	3.197328	1.7E-08	1.07E+12	5.02923	228.3
Brazil	1988	1.91E-06	23632	2.988054	1.14E-07	1.15E+12	1.326337	629.1
Brazil	1989	2.93E-05	473795.3	2.182496	1.23E-06	1.19E+12	0.971918	1430.7
Brazil	1990	0.000893	3510200	1.795275	2.96E-05	1.19E+12	3.426233	2947.7
Brazil	1991	25.15128	21117945	0.000398	0.000176	1.23E+12	3.15446	432.8
Brazil	1992	0.050029	3.91E+08	2.339147	0.001953	1.19E+12	1.811397	951.6
Brazil	1993	1.014576	1.32E+10	2.35631	0.038277	1.21E+12	1.180009	1928
Brazil	1994	22.07603	1.59E+11	1.937476	0.664684	1.21E+12	2.426698	2075.9
Mexico	1980	0.078083	1.4E+09	11.10728	0.022951	5.18E+11	3.801493	26.4
Mexico	1981	0.09989	2.11E+09	10.2306	0.024515	5.63E+11	3.457622	27.9
Mexico	1982	0.158749	3.26E+09	15.72322	0.056402	5.6E+11	3.578309	58.9
Mexico	1983	0.320291	5.33E+09	17.12646	0.120094	5.36E+11	3.993709	101.8
Mexico	1984	0.530209	9.01E+09	15.08221	0.167828	5.56E+11	3.894447	65.5
Mexico	1985	0.836396	1.28E+10	15.15477	0.256872	5.7E+11	4.408183	57.7
Mexico	1986	1.557652	2.19E+10	19.74072	0.611773	5.49E+11	4.305275	86.2
Mexico	1987	3.611054	5.28E+10	19.9006	1.378183	5.59E+11	4.359042	131.8
Mexico	1988	7.733494	4.59E+10	15.94074	2.273105	5.66E+11	10.12795	114.2
Mexico	1989	9.280811	9E+10	15.07811	2.461473	5.9E+11	6.809884	20
Mexico	1990	11.75439	1.65E+11	14.33764	2.812599	6.2E+11	5.000604	26.7
Mexico	1991	25.15128	2.47E+11	7.495568	3.01843	6.46E+11	4.291005	22.7
Mexico	1992	16.65416	3.05E+11	11.9582	3.094898	6.69E+11	4.120064	15.5
Peru	1980	1.39E-06	1275.8	7.878993	2.89E-07	6.47E+10	3.769159	59.1
Peru	1981	2.43E-06	2152	7.243605	4.22E-07	6.83E+10	3.99054	75.4
Peru	1982	4E-06	3700.5	7.723877	6.98E-07	6.82E+10	3.899473	64.4
Peru	1983	8.44E-06	7524.8	8.814007	1.63E-06	6.11E+10	3.474511	111.2
Peru	1984	1.77E-05	17097.8	9.332775	3.47E-06	6.33E+10	3.412369	110.2
Peru	1985	4.67E-05	43863.8	11.5966	1.1E-05	6.46E+10	3.635344	163.4
Peru	1986	8.31E-05	67540.6	8.436044	1.39E-05	7.07E+10	4.461465	77.9
Peru	1987	0.000154	139481.4	5.682419	1.68E-05	7.75E+10	4.271537	85.8

Peru	1988	0.001185	1005593	5.89641	0.000129	7.02E+10	3.960104	667
Peru	1989	0.041458	20285642	3.656156	0.002666	6.16E+10	4.567803	3398.7
Peru	1990	3.143174	1.32E+09	3.581749	0.187886	5.85E+10	4.144709	7481.7
Peru	1991	25.15128	4.35E+09	1.918324	0.7725	5.98E+10	6.100888	409.5
Peru	1992	27.79128	8.18E+09	2.884653	1.245833	5.95E+10	5.465256	73.5

Table A2: States of the former USSR Data Used in the Panel Econometric Analysis

COUNTRY	YEAR	CPI=100	M2	RER	NER	RGDP US\$	Velocity	INFL
Armenia	1991	0.25	1.4E+10	838.3011	5.546	5613988348	0.005692	196
Armenia	1992	0.457	247755114	852.6148	9.347	3267341064	1.252002	1863
Armenia	1993	0.46203	2915502675	872.107	9.105	2979815090	1.446889	1938
Armenia	1994	16.0485	2.4501E+10	821.5435	288.6508	3140725188	7.635097	3373.5
Armenia	1995	44.28606	4.0251E+10	436.7264	405.9083	3357435176	12.97496	176.0
Armenia	1996	52.55922	5.4371E+10	388.723	414.0415	3554362204	12.16114	18.7
Armenia	1997	59.89688	7.0247E+10	411.8938	490.8468	3672405406	11.45008	14.0
Armenia	1998	65.09143	9.6037E+10	404.4714	504.915	3940491000	9.948053	8.7
Armenia	1999	65.51339	1.0945E+11	442.9336	535.0618	4070527203	9.021516	0.6
Armenia	2000	64.99525	1.5165E+11	471.9201	539.5258	4310688308	6.800634	-0.8
Armenia	2001	67.03994	1.5815E+11	496.1245	555.0783	4722645336	7.435139	3.1
Armenia	2002	67.7506	2.1189E+11	528.5581	573.3533	5345387543	6.430207	1.1
Armenia	2003	70.94948	2.3382E+11	524.9207	578.763	6095922453	6.948324	4.7
Azerbaijan	1991	0.043111	3.1E+10	460.1874	0.525	2.2169E+10	1.72E-05	189.0
Azerbaijan	1992	0.038528	1860280	11.72871	0.01084	1.7159E+10	2.591062	-10.6
Azerbaijan	1993	0.473123	17222770.8	1.870283	0.019995	1.3195E+10	1.824125	1128.0
Azerbaijan	1994	8.337456	209523185	1.720484	0.314045	1.0596E+10	1.788238	1662.2
Azerbaijan	1995	42.66773	262783252	0.985749	0.882709	9345558793	8.12	411.8
Azerbaijan	1996	51.11373	307699952	0.830489	0.860253	9467051076	8.880859	19.8
Azerbaijan	1997	52.99182	435165402	0.756021	0.797075	1.0016E+10	7.257654	3.7
Azerbaijan	1998	52.58236	369145135	0.76733	0.7738	1.1018E+10	9.320508	-0.8
Azerbaijan	1999	48.09962	443230761	0.929111	0.824033	1.1833E+10	8.517189	-8.5
Azerbaijan	2000	48.96782	768617344	1.038886	0.894831	1.3147E+10	6.138425	1.8
Azerbaijan	2001	49.72545	687393465	1.122248	0.931317	1.4448E+10	7.73298	1.5

Azerbaijan	2002	51.10342	786909528	1.188155	0.972164	1.598E+10	7.704139	2.8
Azerbaijan	2003	52.24501	1020860405	1.209688	0.982146	1.7769E+10	7.000467	2.2
Belarus	1991	0.00012	5.421E+10	3.62E+08	1150	3.1237E+10	0.000161	183.0
Belarus	1992	0.000145	5.121E+10	7.48E+08	2597	2.8238E+10	0.001805	718.7
Belarus	1993	0.001866	6140212900	79465039	3351.345	2.6092E+10	0.16047	1190.2
Belarus	1994	0.043319	6940212900	17339153	16444.37	2.3039E+10	2.563783	2221.0
Belarus	1995	0.350603	1.7934E+10	0.156575	0.001152	2.0643E+10	6.769236	709.3
Belarus	1996	0.535413	2.7337E+10	0.12193	0.001323	2.1221E+10	7.017581	52.7
Belarus	1997	0.877743	5.7779E+10	0.149002	0.002602	2.364E+10	6.34882	63.9
Belarus	1998	1.517351	2.1725E+11	0.158514	0.004613	2.5626E+10	3.232006	72.9
Belarus	1999	5.973489	5.0544E+11	0.226335	0.02493	2.6497E+10	5.986962	293.7
Belarus	2000	16.046	1.6137E+12	0.310632	0.087675	2.8034E+10	5.66011	168.6
Belarus	2001	25.85571	2.5623E+12	0.322128	0.139	2.9359E+10	6.702291	61.1
Belarus	2002	36.8541	3.8185E+12	0.30351	0.179092	3.084E+10	6.845103	42.5
Belarus	2003	47.31986	5.8937E+12	0.278947	0.205127	3.3012E+10	6.204007	28.4
Kazakhstan	1991	0.1324	6.1828E+10	627.9063	2.2	8.5702E+10	0.002777	80.6
Kazakhstan	1992	0.2543	3.5013E+10	163.927	0	8.116E+10	0.069556	0.0
Kazakhstan	1993	0.375368	8198000000	259.3734	2.2	7.3693E+10	3.589058	471.2
Kazakhstan	1994	7.422427	5.5417E+10	218.6973	35.53833	6.4408E+10	7.641496	1877.4
Kazakhstan	1995	20.49742	1.1538E+11	141.6847	60.95	5.9126E+10	8.789694	176.2
Kazakhstan	1996	28.52884	1.3945E+11	116.412	67.30333	5.9422E+10	10.15224	39.2
Kazakhstan	1997	33.49515	1.73E+11	113.2006	75.4375	6.0432E+10	9.665621	17.4
Kazakhstan	1998	35.88882	1.4855E+11	113.7665	78.30333	5.9284E+10	11.66794	7.1
Kazakhstan	1999	38.86617	2.7388E+11	166.7807	119.5233	6.0884E+10	7.362547	8.3
Kazakhstan	2000	43.98907	3.9702E+11	183.6915	142.1333	6.6851E+10	6.548622	13.2
Kazakhstan	2001	47.66398	5.5663E+11	184.4658	146.7358	7.5876E+10	5.839813	8.4
Kazakhstan	2002	50.44609	7.2392E+11	189.775	153.2792	8.3312E+10	5.216396	5.8
Kazakhstan	2003	53.69392	9.7175E+11	179.258	149.5758	9.106E+10	4.746054	6.4
Romania	1991	0.077334	108866900	3.732586	0.007639	1.0801E+11	2.148774	230.6
Romania	1992	0.240668	211959000	5.334125	0.030795	9.8541E+10	3.019241	211.2
Romania	1993	0.854773	576881900	3.935065	0.076005	1.0005E+11	3.686467	255.2
Romania	1994	2.023756	1300562200	3.73555	0.165509	1.0398E+11	4.062156	136.8

Romania	1995	2.676266	2205990000	3.620058	0.203328	1.114E+11	3.470868	32.2
Romania	1996	3.715441	3740150000	4.096188	0.308422	1.1572E+11	3.064984	38.8
Romania	1997	9.465587	7982590000	3.806191	0.716794	1.1014E+11	3.218141	154.8
Romania	1998	15.05942	1.2273E+10	3.073135	0.887558	1.0784E+11	3.035727	59.1
Romania	1999	21.95721	1.8459E+10	3.787129	1.533284	1.0741E+11	3.005598	45.8
Romania	2000	31.98432	2.5992E+10	3.858646	2.170872	1.0998E+11	3.126979	45.7
Romania	2001	43.0086	3.0676E+10	4.048761	2.906079	1.1613E+11	3.857332	34.5
Romania	2002	52.70154	4.497E+10	3.917446	3.305543	1.2215E+11	3.39404	22.5
Romania	2003	60.75116	5.4446E+10	3.51663	3.320007	1.289E+11	3.650592	15.3
Russia	1991	0.03467	1.201E+15	3.732586	0.786	1.3425E+12	1.08E-06	191.0
Russia	1992	0.053597	6.0052E+14	5.334125	0.985	1.1474E+12	2.93E-05	0.0
Russia	1993	0.522371	4.0983E+10	3.935065	0.991667	1.048E+12	3.880715	874.6
Russia	1994	2.129363	1.2973E+11	3.73555	2.19075	9.1625E+11	4.365596	307.6
Russia	1995	6.334246	2.7578E+11	3.620058	4.55915	8.7829E+11	5.179915	197.5
Russia	1996	9.358321	3.573E+11	4.096188	5.120833	8.4667E+11	5.619516	47.7
Russia	1997	10.74024	4.6036E+11	3.806191	5.784833	8.5852E+11	5.08844	14.8
Russia	1998	13.71259	6.3363E+11	3.073135	9.705083	8.1302E+11	4.150112	27.7
Russia	1999	25.47001	9.932E+11	3.787129	24.6199	8.6505E+11	4.856251	85.7
Russia	2000	30.76174	1.5686E+12	3.858646	28.12917	9.5156E+11	4.657431	20.8
Russia	2001	37.36255	2.1382E+12	4.048761	29.16853	1E+12	4.182741	21.5
Russia	2002	43.26285	2.86E+12	3.917446	31.34848	1.0474E+12	3.786918	15.8
Russia	2003	49.18108	3.9621E+12	3.51663	30.69203	1.1239E+12	3.333658	13.7

Table A3: Africa Data Used in the Panel Econometric Analysis

COUNTRY	YEA R	CPI=100	M2	RER	NER	RGDP US\$	Velocity	INFL
Congo	1988	1.12E-10	584000	301.88	6.2343E-10	2.51E+10	9.05671E-06	71.1
Congo	1989	2.28E-10	977000	316.9712	1.27121E-09	2.48E+10	1.86603E-05	104.1
Congo	1990	4.13E-10	2886000	347.4401	2.39475E-09	2.31E+10	1.23046E-05	81.3
Congo	1991	9.31E-09	7182000	348.4844	5.19457E-08	2.12E+10	0.000102619	2154.4
Congo	1992	3.94E-07	27970371	351.3659	2.15136E-06	1.9E+10	0.001000633	4129.2
Congo	1993	8.22E-06	8260000	202.6474	2.51442E-05	1.64E+10	0.051673637	1986.9

Congo	1994	0.001962	5838930	413.6153	0.011941192	1.58E+1 0	18.82633182	23773.1
Congo	1995	0.012597	26720830	389.6774	0.070244717	1.59E+1 0	23.51910297	541.9
Congo	1996	0.074632	296000000	483.6889	0.501849175	1.57E+1 0	15.52241441	492.4
Congo	1997	0.222789	770000000	433.9829	1.3134476	1.48E+1 0	16.06688402	198.5
Congo	1998	0.287729	3.71E+09	417.5782	1.607232436	1.46E+1 0	4.268565389	29.1
Congo	1999	1.107454	2.2E+10	277.343	4.020686844	1.4E+10	3.733732308	284.9
Congo	2000	6.798738	2.13E+10	253.5792	21.83111218	1.3E+10	22.1108317	513.9
Angola	1990	2.22E-08	230408701	80.75132	2.9918E-08	1.27E+1 0	1.77396E-06	1.8
Angola	1991	4.08E-08	241468701	84.34547	5.50983E-08	1.31E+1 0	3.69262E-06	83.60833
Angola	1992	1.4	3.395E+0 9	99.25415	2.51417E-07	2.95E+1 0	1.37639E-06	299.0605
Angola	1993	27.9	1.713E+1 0	73.12525	2.66017E-06	2.22E+1 0	2.09212E-06	1379.414
Angola	1994	299.8	3.46E+11	159.9044	0.000059515	2.3E+10	2.38416E-06	948.8112
Angola	1995	11647	5.479E+0 9	274.5971	0.00275023	2.53E+1 0	0.003334334	2671.792
Angola	1996	203768	1.961E+1 1	309.952	0.128029167	2.82E+1 0	0.005696886	4145.108
Angola	1997	0.094834	27600000	177.7876	0.229040083	3.04E+1 0	84.86757355	219.1767
Angola	1998	0.196576	266500000	149.3859	0.392823518	3.25E+1 0	12.70270087	107.2848
Angola	1999	0.68447	7.003E+0 9	311.4602	2.790706167	3.35E+1 0	3.278722675	248.1959
Angola	2000	2.908976	1.635E+1 0	272.5733	10.04054417	3.45E+1 0	7.49706352	324.9969
Angola	2001	7.346938	4.138E+1 0	243.7961	22.05786167	3.6E+10	6.369498759	152.561
Angola	2002	15.34757	1.07E+11	233.9672	43.53020667	3.35E+1 0	6.217621664	108.8974
Zimbabwe	1997	20	40275.358	35.53292	18.80618347	1.55E+1 0	2.69232161	18.85712
Zimbabwe	1998	22.90253	48980.8	43.10796	23.6833991	1.6E+10	3.028758127	31.50782
Zimbabwe	1999	36.30266	67748.067	46.69136	38.30141079	1.58E+1 0	3.371071886	58.19207
Zimbabwe	2000	56.5836	99451.317	36.01224	44.61166667	1.54E+1 0	3.633666903	55.68497
Zimbabwe	2001	100	179226.18	91.60409	192.25	1.56E+1 0	3.957088274	74.46315
Zimbabwe	2002	240.0438	396269.43	146.3813	712.0833333	1.42E+1 0	4.285418043	134.5353
Zimbabwe	2003	1276.331	56839.858	32.44945	824	1.18E+1 0	97.09308443	384.716
Zimbabwe	2004	4880.454	6853786.2	54.78658	5127.916667	1.11E+1 0	3.491390809	381.4474
Zimbabwe	2005	19625.17	27867741	66.6236	24108.86833	1.05E+1 0	2.784711444	266.7663
Zimbabwe	2006	234849.3	345385953	2.001168	8266.75	1.01E+1 0	2.349947776	1033.444

Zimbabwe	2007	5756411 5	108687989	10.58271	10166666.67	9.73E+0 9	733.5286603	12562.68
Zimbabwe	2008	1.43E+2 3	2.308E+1 6	1.3E-12	2976936137	8.01E+0 9	3241.829962	3.33E+1 4

EViews Technical Output

Table A4: Unit Root Tests

Log (M2_Latin America) is I (2)

Panel unit root test: Summary				
Series: D(M2)				
Sample: 1980 1994				
Exogenous variables: Individual effects				
Automatic selection of maximum lags				
Automatic lag length selection based on SIC: 0 to 1				
Newey-West automatic bandwidth selection and Bartlett kernel				
Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	0.65922	0.7451	6	62
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-15.8957	0.0000	6	62
ADF - Fisher Chi-square	25.7144	0.0118	6	62
PP - Fisher Chi-square	4.81263	0.9639	6	66
** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.				

Log (RER_Latin America) is I (2)

Panel unit root test: Summary				
Series: D(RER,2)				
Date: 09/29/17 Time: 19:03				
Sample: 1980 1994				
Exogenous variables: Individual effects				
Automatic selection of maximum lags				
Automatic lag length selection based on SIC: 0				
Newey-West automatic bandwidth selection and Bartlett kernel				
Balanced observations for each test				
Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	9.30775	1.0000	4	40
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	37.9184	1.0000	4	40
ADF - Fisher Chi-square	23.3060	0.0030	4	40
PP - Fisher Chi-square	35.3024	0.0000	4	40
** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.				

Log (CPI_Latin America) is I (2)

Panel unit root test: Summary				
Series: CPI				
Date: 09/29/17 Time: 17:52				
Sample: 1980 1994				
Exogenous variables: Individual effects				
Automatic selection of maximum lags				
Automatic lag length selection based on SIC: 0 to 1				
Newey-West automatic bandwidth selection and Bartlett kernel				
Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-4.65412	0.0000	7	81
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-2.27959	0.0113	7	81
ADF - Fisher Chi-square	25.8944	0.0267	7	81
PP - Fisher Chi-square	18.4892	0.1854	7	84
** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.				

Log (CPI_Eastern Europe) is I (1)

Null Hypothesis: Unit root (individual unit root process)				
Series: LNCPI				
Date: 10/14/17 Time: 03:32				
Sample: 1991 2003				
Exogenous variables: Individual effects				
User-specified lags: 1				
Total (balanced) observations: 66				
Cross-sections included: 6				
Method	Statistic	Prob.**		
ADF - Fisher Chi-square	67.9063	0.0000		
ADF - Choi Z-stat	-5.83497	0.0000		
** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.				
Intermediate ADF test results LNCPI				
Cross section	Prob.	Lag	Max Lag	Obs
Armenia	0.1581	1	1	11
Azerbaijan	0.0000	1	1	11
Belarus	0.0049	1	1	11
Kazakhstan	0.1123	1	1	11
Romania	0.1499	1	1	11
Russia	0.0000	1	1	11

Log (M2_Eastern Europe) is I (1)

Null Hypothesis: Unit root (individual unit root process)				
Series: LNM2				
Date: 10/14/17 Time: 03:41				
Sample: 1991 2003				
Exogenous variables: Individual effects				
User-specified lags: 1				
Total (balanced) observations: 66				
Cross-sections included: 6				
<hr/>				
Method		Statistic		Prob.**
ADF - Fisher Chi-square		66.0987		0.0000
ADF - Choi Z-stat		-4.69705		0.0000
<hr/>				
** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.				
Intermediate ADF test results LNM2				
<hr/>				
Cross section	Prob.	Lag	Max Lag	Obs
Armenia	0.0000	1	1	11
Azerbaijan	0.0004	1	1	11
Belarus	0.9005	1	1	11
Kazakhstan	0.8180	1	1	11
Romania	0.0027	1	1	11
Russia	0.0003	1	1	11
<hr/>				

Log (NER_Eastern Europe) is I (1)

Null Hypothesis: Unit root (individual unit root process)				
Series: LNNER				
Date: 10/14/17 Time: 03:42				
Sample: 1991 2003				
Exogenous variables: Individual effects				
User-specified lags: 1				
Total number of observations: 64				
Cross-sections included: 6				
<hr/>				
Method		Statistic		Prob.**
ADF - Fisher Chi-square		31.2531		0.0018
ADF - Choi Z-stat		-2.28698		0.0111
<hr/>				
** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.				
Intermediate ADF test results LNNER				
<hr/>				
Cross section	Prob.	Lag	Max Lag	Obs
Armenia	0.1498	1	1	11
Azerbaijan	0.0000	1	1	11
Belarus	0.3621	1	1	11
Kazakhstan	0.6926	1	1	9
Romania	0.1576	1	1	11
<hr/>				

Russia	0.5752	1	1	11
--------	--------	---	---	----

Log (RGDP_Africa) is I (1)

Null Hypothesis: Unit root (individual unit root process)
 Series: LNRGDP_US\$
 Date: 10/22/17 Time: 22:00
 Sample: 1988 2008
 Exogenous variables: Individual effects, individual linear trends
 User-specified lags: 1
 Total number of observations: 32
 Cross-sections included: 3

Method	Statistic	Prob.**
ADF - Fisher Chi-square	20.6911	0.0021
ADF - Choi Z-stat	-2.36518	0.0090

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Intermediate ADF test results LNRGDP_US\$

Cross section	Prob.	Lag	Max Lag	Obs
Congo	0.2522	1	1	11
Angola	0.0002	1	1	11
Zim	0.5235	1	1	10

Log (CPI_Africa) is I (2)

Null Hypothesis: Unit root (individual unit root process)
 Series: D(LNCPI_100,2)
 Date: 10/22/17 Time: 22:12
 Sample: 1988 2008
 Exogenous variables: None
 User-specified lags: 1
 Total number of observations: 26
 Cross-sections included: 3

Method	Statistic	Prob.**
ADF - Fisher Chi-square	18.4368	0.0052
ADF - Choi Z-stat	-1.04168	0.1488

** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Intermediate ADF test results D(LNCPI_100,2)

Cross section	Prob.	Lag	Max Lag	Obs
Congo	0.0269	1	1	9
Angola	0.0037	1	1	9
Zim	0.9975	1	1	8

Log (M2_Africa) is I (2)

Null Hypothesis: Unit root (individual unit root process)				
Series: D(LNM2,2)				
Date: 10/22/17 Time: 22:14				
Sample: 1988 2008				
Exogenous variables: Individual effects				
User-specified lags: 1				
Total number of observations: 26				
Cross-sections included: 3				
<hr/>				
Method		Statistic		Prob.**
ADF - Fisher Chi-square		12.7553		0.0471
ADF - Choi Z-stat		-1.93777		0.0263
<hr/>				
** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.				
Intermediate ADF test results D(LNM2,2)				
<hr/>				
Cross section	Prob.	Lag	Max Lag	Obs
Congo	0.0934	1	1	9
Angola	0.0550	1	1	9
Zim	0.3306	1	1	8
<hr/>				

Log (NER_Africa) is I (2)

Null Hypothesis: Unit root (individual unit root process)				
Series: D(LNNER,2)				
Date: 10/22/17 Time: 23:47				
Sample: 1988 2008				
Exogenous variables: Individual effects				
User-specified lags: 1				
Total number of observations: 26				
Cross-sections included: 3				
<hr/>				
Method		Statistic		Prob.**
ADF - Fisher Chi-square		17.6076		0.0073
ADF - Choi Z-stat		-2.65593		0.0040
<hr/>				
** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.				
Intermediate ADF test results D(LNNER,2)				
<hr/>				
Cross section	Prob.	Lag	Max Lag	Obs
Congo	0.1737	1	1	9
Angola	0.1008	1	1	9
Zim	0.0086	1	1	8
<hr/>				

Table A5: Augmented Dickey-Fuller Test for Unit Root for Real Exchange Rate for Latin America

Null Hypothesis: Unit root (individual unit root process)				
Series: RER				
Sample: 1980 1994				
Exogenous variables: Individual effects, individual linear trends				
Automatic lag length selection based on SIC: 0				
Total (balanced) observations: 60				
Cross-sections included: 5				
<hr/>				
Method	Statistic	Prob.**		
ADF - Fisher Chi-square	13.0867	0.2189		
ADF - Choi Z-stat	-0.73501	0.2312		
<hr/>				
Intermediate ADF test results LNRER				
<hr/>				
Cross Section	Prob.	Lag	Max Lag	Obs
ARG	0.8304	0	1	12
BOLV	0.0559	0	1	12
BRAZ	0.1033	0	1	12
MEX	0.5026	0	1	12
PERU	0.5979	0	1	12
<hr/>				

Table A6: Augmented Dickey-Fuller Test for Unit Root for Real Exchange Rate for States of the former USSR

Null Hypothesis: Unit root (individual unit root process)				
Series: RER				
Sample: 1991 2003				
Exogenous variables: Individual effects, individual linear trends				
Automatic lag length selection based on SIC: 0				
Total (balanced) observations: 72				
Cross-sections included: 6				
<hr/>				
Method	Statistic	Prob.**		
ADF - Fisher Chi-square	35.3500	0.0004		
ADF - Choi Z-stat	-2.41387	0.0079		
<hr/>				
Intermediate ADF test results LNRER				
<hr/>				
Cross section	Prob.	Lag	Max Lag	Obs
Armenia	0.9027	0	1	12
Azerbaijan	0.0001	0	1	12
Belarus	0.8494	0	1	12
Kazakhstan	0.0413	0	1	12
Romania	0.0816	0	1	12
Russia	0.0816	0	1	12
<hr/>				

Table A7: Augmented Dickey-Fuller Test for Unit Root for Real Exchange Rate for Africa

Null Hypothesis: Unit root (individual unit root process)				
Series: RER				
Sample: 1988 2008				
Exogenous variables: Individual effects, individual linear trends				
User-specified lags: 1				
Total number of observations: 29				
Cross-sections included: 3				
<hr/>				
Method	Statistic	Prob.**		
ADF - Fisher Chi-square	12.8771	0.0450		
ADF - Choi Z-stat	-1.65906	0.0486		
<hr/>				
Intermediate ADF test results D(LNRER)				
<hr/>				
Cross section	Prob.	Lag	Max Lag	Obs
Congo	0.5975	1	1	10
Angola	0.1604	1	1	10
Zim	0.0167	1	1	9
<hr/>				

Table A8: Velocity as a function of current and lagged inflation Latin America

Dependent Variable: VELOCITY				
Method: Panel Least Squares				
Date: 11/04/17 Time: 17:15				
Sample (adjusted): 1982 1994				
Periods included: 13				
Cross-sections included: 5				
Total panel (unbalanced) observations: 55				
<hr/>				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.483491	0.337527	13.28335	0.0000
INFLATION	0.000124	0.000148	0.842579	0.4034
INFLATION(-1)	0.000391	0.000150	2.606840	0.0120
INFLATION(-2)	0.000134	0.000148	0.901352	0.3716
<hr/>				
R-squared	0.168058	Mean dependent var	5.007007	
Adjusted R-squared	0.119121	S.D. dependent var	2.214453	
S.E. of regression	2.078378	Akaike info criterion	4.371000	
Sum squared resid	220.3025	Schwarz criterion	4.516988	
Log likelihood	-116.2025	Hannan-Quinn criter.	4.427455	
F-statistic	3.434128	Durbin-Watson stat	0.564889	
Prob(F-statistic)	0.023615			
<hr/>				

States of the former USSR

Dependent Variable: VELOCITY
Method: Panel Least Squares
Date: 11/04/17 Time: 17:13

Sample (adjusted): 1993 2003
 Periods included: 11
 Cross-sections included: 6
 Total panel (balanced) observations: 66

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.611229	0.340238	16.49207	0.0000
INFLATION	-0.001766	0.000537	-3.288993	0.0017
INFLATION(-1)	0.000613	0.000576	1.065165	0.2909
INFLATION(-2)	0.001850	0.000504	3.674038	0.0005
R-squared	0.315700	Mean dependent var		5.938192
Adjusted R-squared	0.282589	S.D. dependent var		2.738259
S.E. of regression	2.319309	Akaike info criterion		4.579107
Sum squared resid	333.5100	Schwarz criterion		4.711814
Log likelihood	-147.1105	Hannan-Quinn criter.		4.631546
F-statistic	9.534524	Durbin-Watson stat		0.714671
Prob(F-statistic)	0.000029			

Africa
 Method: Panel Least Squares
 Date: 11/04/17 Time: 17:09
 Sample (adjusted): 1990 2008
 Periods included: 19
 Cross-sections included: 3
 Total panel (unbalanced) observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	35.96839	27.19337	1.322690	0.1966
INFLATION	9.61E-12	4.57E-13	20.99865	0.0000
INFLATION(-1)	0.000281	0.005811	0.048324	0.9618
INFLATION(-2)	-0.001071	0.005796	-0.184775	0.8547
R-squared	0.950514	Mean dependent var		135.0427
Adjusted R-squared	0.945212	S.D. dependent var		581.5137
S.E. of regression	136.1142	Akaike info criterion		12.78133
Sum squared resid	518758.1	Schwarz criterion		12.96455
Log likelihood	-200.5013	Hannan-Quinn criter.		12.84207
F-statistic	179.2718	Durbin-Watson stat		2.164317
Prob(F-statistic)	0.000000			

Table A9: Panel with year dummies

Latin America
 Dependent Variable: VELOCITY
 Method: Panel Least Squares
 Date: 11/04/17 Time: 15:51
 Sample (adjusted): 1982 1994
 Periods included: 13
 Cross-sections included: 5
 Total panel (unbalanced) observations: 55

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.553140	0.500982	9.088439	0.0000
INFLATION	0.000132	0.000155	0.854879	0.3967
INFLATION(-1)	0.000399	0.000157	2.539532	0.0143
INFLATION(-2)	0.000128	0.000153	0.838640	0.4057
DUMMY_YEARS	-0.123104	0.649086	-0.189657	0.8503
R-squared	0.168657	Mean dependent var		5.007007
Adjusted R-squared	0.102149	S.D. dependent var		2.214453
S.E. of regression	2.098305	Akaike info criterion		4.406644
Sum squared resid	220.1441	Schwarz criterion		4.589129
Log likelihood	-116.1827	Hannan-Quinn criter.		4.477213
F-statistic	2.535903	Durbin-Watson stat		0.567685
Prob(F-statistic)	0.051509			

States of the former USSR

Dependent Variable: VELOCITY				
Method: Panel Least Squares				
Date: 11/04/17 Time: 16:26				
Sample (adjusted): 1993 2003				
Periods included: 11				
Cross-sections included: 6				
Total panel (balanced) observations: 66				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.848424	0.358373	16.31939	0.0000
INFLATION	-0.001263	0.000595	-2.123848	0.0377
INFLATION(-1)	0.001130	0.000632	1.788424	0.0787
INFLATION(-2)	0.001674	0.000504	3.323803	0.0015
DUMMY_YEARS	-1.612412	0.882945	-1.826176	0.0727
R-squared	0.351172	Mean dependent var		5.938192
Adjusted R-squared	0.308626	S.D. dependent var		2.738259
S.E. of regression	2.276833	Akaike info criterion		4.556182
Sum squared resid	316.2219	Schwarz criterion		4.722065
Log likelihood	-145.3540	Hannan-Quinn criter.		4.621730
F-statistic	8.253925	Durbin-Watson stat		0.747007
Prob(F-statistic)	0.000022			

Africa

Dependent Variable: VELOCITY				
Method: Panel Least Squares				
Date: 11/04/17 Time: 16:55				
Sample (adjusted): 1990 2008				
Periods included: 19				
Cross-sections included: 3				
Total panel (unbalanced) observations: 32				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.272536	61.59622	0.053129	0.9580

INFLATION	9.60E-12	4.63E-13	20.74464	0.0000
INFLATION(-1)	-0.000222	0.005941	-0.037403	0.9704
INFLATION(-2)	-0.001537	0.005917	-0.259723	0.7970
DUMMY_YEARS	40.70170	68.60393	0.593285	0.5579
R-squared	0.951151	Mean dependent var	135.0427	
Adjusted R-squared	0.943914	S.D. dependent var	581.5137	
S.E. of regression	137.7171	Akaike info criterion	12.83088	
Sum squared resid	512082.3	Schwarz criterion	13.05990	
Log likelihood	-200.2941	Hannan-Quinn criter.	12.90680	
F-statistic	131.4302	Durbin-Watson stat	2.186440	
Prob(F-statistic)	0.000000			

Table A10: Panel with country dummies

Africa

Dependent Variable: VELOCITY

Method: Panel Least Squares

Date: 11/04/17 Time: 17:48

Sample (adjusted): 1990 2008

Periods included: 19

Cross-sections included: 3

Total panel (unbalanced) observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	8.008807	41.39843	0.193457	0.8481
INFLATION	9.35E-12	4.80E-13	19.49787	0.0000
INFLATION(-1)	0.002188	0.005987	0.365412	0.7178
INFLATION(-2)	0.000930	0.005982	0.155482	0.8776
DUMMY_CONGO	-8.100093	60.17907	-0.134600	0.8940
DUMMY_ZIM	86.20135	60.82021	1.417314	0.1683
R-squared	0.955090	Mean dependent var	135.0427	
Adjusted R-squared	0.946454	S.D. dependent var	581.5137	
S.E. of regression	134.5628	Akaike info criterion	12.80930	
Sum squared resid	470785.7	Schwarz criterion	13.08412	
Log likelihood	-198.9488	Hannan-Quinn criter.	12.90040	
F-statistic	110.5875	Durbin-Watson stat	2.196981	
Prob(F-statistic)	0.000000			

States of the former USSR

Dependent Variable: VELOCITY

Method: Panel Least Squares

Date: 11/04/17 Time: 17:57

Sample (adjusted): 1993 2003

Periods included: 11

Cross-sections included: 6

Total panel (balanced) observations: 66

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.471647	0.504678	8.860401	0.0000
INFLATION	-0.002034	0.000387	-5.255805	0.0000
INFLATION(-1)	0.000386	0.000415	0.930423	0.3561

INFLATION(-2)	0.001454	0.000369	3.936752	0.0002
DUMMY_ARMENIA	3.795685	0.764039	4.967921	0.0000
DUMMY_AZER	2.329802	0.694033	3.356902	0.0014
DUMMY_BELA	0.707421	0.723276	0.978080	0.3322
DUMMY_KAZAKH	2.949637	0.707847	4.167054	0.0001
DUMMY_ROMA	-1.101352	0.707255	-1.557219	0.1250
R-squared	0.678744	Mean dependent var	5.938192	
Adjusted R-squared	0.633656	S.D. dependent var	2.738259	
S.E. of regression	1.657369	Akaike info criterion	3.974464	
Sum squared resid	156.5717	Schwarz criterion	4.273053	
Log likelihood	-122.1573	Hannan-Quinn criter.	4.092450	
F-statistic	15.05360	Durbin-Watson stat	1.597054	
Prob(F-statistic)	0.000000			

Latin America

Dependent Variable: VELOCITY				
Method: Panel Least Squares				
Date: 11/04/17 Time: 17:42				
Sample (adjusted): 1982 1994				
Periods included: 13				
Cross-sections included: 5				
Total panel (unbalanced) observations: 55				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3.459417	0.620740	5.573057	0.0000
INFLATION	0.000171	0.000137	1.256090	0.2153
INFLATION(-1)	0.000416	0.000137	3.035846	0.0039
INFLATION(-2)	0.000156	0.000137	1.137336	0.2612
DUMMY_ARG	2.298153	0.805365	2.853556	0.0064
DUMMY_BOLV	1.374963	0.800490	1.717652	0.0924
DUMMY_BRAZ	-0.418289	0.803239	-0.520753	0.6050
DUMMY_MEX	1.482401	0.835552	1.774158	0.0825
R-squared	0.375185	Mean dependent var	5.007007	
Adjusted R-squared	0.282128	S.D. dependent var	2.214453	
S.E. of regression	1.876247	Akaike info criterion	4.230147	
Sum squared resid	165.4542	Schwarz criterion	4.522123	
Log likelihood	-108.3291	Hannan-Quinn criter.	4.343057	
F-statistic	4.031759	Durbin-Watson stat	0.738500	
Prob(F-statistic)	0.001563			

Table A11: Panel Estimation of the Long Run Relationship (Latin America)

Pedroni Residual Cointegration Test	
Series: DLNM2 D2LNGDP D2LNCPI_100	
Date: 12/19/17 Time: 17:23	
Sample: 1980 1994	
Included observations: 65	
Cross-sections included: 5	
Null Hypothesis: No cointegration	
Trend assumption: Deterministic intercept and trend	
Use d.f. corrected Dickey-Fuller residual variances	
Automatic lag length selection based on SIC with a max lag of 1	

Newey-West automatic bandwidth selection and Bartlett kernel					
Alternative hypothesis: common AR coefs. (within-dimension)					
	<u>Statistic</u>	<u>Prob.</u>	<u>Weighted Statistic</u>	<u>Prob.</u>	
Panel v-Statistic	11.74737	0.0000	6.211187	0.0000	
Panel rho-Statistic	1.738966	0.9590	-0.127349	0.4493	
Panel PP-Statistic	0.493699	0.6892	-12.13272	0.0000	
Panel ADF-Statistic	0.558986	0.7119	-6.728554	0.0000	
Alternative hypothesis: individual AR coefs. (between-dimension)					
	<u>Statistic</u>	<u>Prob.</u>			
Group rho-Statistic	1.238239	0.8922			
Group PP-Statistic	-15.24887	0.0000			
Group ADF-Statistic	-6.790194	0.0000			
Cross section specific results					
Phillips-Peron results (non-parametric)					
Cross ID	AR(1)	Variance	HAC	Bandwidth	Obs
ARG	0.237	0.148670	0.058084	4.00	12
BOLV	-0.593	0.010971	0.001203	8.00	12
BRAZ	0.456	0.905695	0.996866	2.00	12
MEX	-0.429	0.016748	0.002354	6.00	12
PERU	-0.644	0.013075	0.010368	2.00	12
Augmented Dickey-Fuller results (parametric)					
Cross ID	AR(1)	Variance	Lag	Max lag	Obs
ARG	-0.203	0.078140	1	1	11
BOLV	-1.575	0.006680	1	1	11
BRAZ	0.456	0.988031	0	1	12
MEX	-1.362	0.012851	1	1	11
PERU	-0.644	0.014263	0	1	12

Table A12: Panel Estimation of the Long Run Relationship (States of the former USSR)

Pedroni Residual Cointegration Test				
Series: LNGDP LNM2 LNCPI				
Date: 12/19/17 Time: 18:23				
Sample: 1991 2003				
Included observations: 78				
Cross-sections included: 6				
Null Hypothesis: No cointegration				
Trend assumption: Deterministic intercept and trend				
Use d.f. corrected Dickey-Fuller residual variances				
Automatic lag length selection based on SIC with a max lag of 1				
Newey-West automatic bandwidth selection and Bartlett kernel				
Alternative hypothesis: common AR coefs. (within-dimension)				
	<u>Statistic</u>	<u>Prob.</u>	<u>Weighted Statistic</u>	<u>Prob.</u>

Panel v-Statistic	2.708785	0.0034	2.054896	0.0199	
Panel rho-Statistic	1.399391	0.9192	1.450837	0.9266	
Panel PP-Statistic	-2.244061	0.0124	-0.863342	0.1940	
Panel ADF-Statistic	-3.378985	0.0004	-1.978426	0.0239	
Alternative hypothesis: individual AR coefs. (between-dimension)					
	<u>Statistic</u>	<u>Prob.</u>			
Group rho-Statistic	2.370146	0.9911			
Group PP-Statistic	-1.357959	0.0872			
Group ADF-Statistic	-1.293800	0.0979			
Cross section specific results					
Phillips-Peron results (non-parametric)					
Cross ID	AR(1)	Variance	HAC	Bandwidth	Obs
Armenia	0.016	0.010932	0.004338	5.00	12
Azerbaijan	0.273	0.000613	0.000523	3.00	12
Belarus	-0.303	0.001165	0.000588	8.00	12
Kazakhstan	0.662	0.001637	0.002141	1.00	12
Romania	0.616	0.000805	0.001082	1.00	12
Russia	0.039	0.002574	0.002574	0.00	12
Augmented Dickey-Fuller results (parametric)					
Cross ID	AR(1)	Variance	Lag	Max lag	Obs
Armenia	-0.641	0.008255	1	1	11
Azerbaijan	0.273	0.000669	0	1	12
Belarus	-0.463	0.000718	1	1	11
Kazakhstan	0.449	0.001650	1	1	11
Romania	0.351	0.000476	1	1	11
Russia	0.039	0.002808	0	1	12

Table A13: Panel Estimation of the Long Run Relationship (Africa)

Pedroni Residual Cointegration Test				
Series: LNCPI_100 LNM2 LNGDP				
Date: 12/19/17 Time: 18:21				
Sample: 1988 2008				
Included observations: 38				
Cross-sections included: 3				
Null Hypothesis: No cointegration				
Trend assumption: Deterministic intercept and trend				
Use d.f. corrected Dickey-Fuller residual variances				
Automatic lag length selection based on SIC with a max lag of 1				
Newey-West automatic bandwidth selection and Bartlett kernel				
Alternative hypothesis: common AR coefs. (within-dimension)				
	<u>Statistic</u>	<u>Prob.</u>	<u>Weighted Statistic</u>	<u>Prob.</u>
Panel v-Statistic	-0.810090	0.7911	-0.506912	0.6939
Panel rho-Statistic	1.219276	0.8886	1.137486	0.8723
Panel PP-Statistic	0.146524	0.5582	0.003538	0.5014

Panel ADF-Statistic	0.315092	0.6237	0.188596	0.5748	
Alternative hypothesis: individual AR coefs. (between-dimension)					
	<u>Statistic</u>	<u>Prob.</u>			
Group rho-Statistic	1.796099	0.9638			
Group PP-Statistic	-0.043914	0.4825			
Group ADF-Statistic	0.418381	0.6622			
Cross section specific results					
Phillips-Peron results (non-parametric)					
Cross ID	AR(1)	Variance	HAC	Bandwidth	Obs
Congo	0.176	1.291079	1.291079	0.00	12
Angola	0.398	13.18264	14.77803	2.00	12
Zim	0.016	7.361655	2.690522	4.00	11
Augmented Dickey-Fuller results (parametric)					
Cross ID	AR(1)	Variance	Lag	Max lag	Obs
Congo	0.176	1.408450	0	1	12
Angola	0.398	14.38106	0	1	12
Zim	0.016	8.097820	0	1	11