Inflation in Latin American Countries: Analysis for Some Countries

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Introduction

In recent decades, Latin American countries have experienced considerably high levels of inflation. While an abundant body of research regarding this topic exists, the two most common viewpoints regarding the causes of inflation in these countries include the monetarist view and the structuralist view. There is a significant amount of relative diversity between the countries comprising Latin America, so this paper seeks to add to the existing body of literature by developing country-specific empirical equations on the causes of inflation. This paper will provide quantitative estimates of hypothesized relationships and magnitudes as well as the significance of those relationships. Overall, this paper seeks to answer the following question: what are the main determinants of

inflation rates in Latin American countries? Upon answering this question, policy makers may be better equipped for generating new policies for stabilizing.

The two competing theories regarding causes of inflation include the monetarist view and the structuralist view. In studying the causes of Latin American inflation, it is important to understand the ideas presented by each school of thought. Monetarists view inflation as a problem due to changes in the amount of money in circulation. There is a positive relation between inflation and the money supply so the degree of inflation is directly related to the magnitude of the increase in the money supply. This is known as the Quantity Theory of Money and provides the theoretical framework for the monetarist view. According to Milton Friedman (1968), there is a distinction between the nominal quantity of money, or the money supply, and the real quantity of money which is the expression of the purchasing power of the nominal money supply. Thus, the demand for money is viewed as a real variable that represents the amount of real purchasing power the public wishes to hold. Viewed in a different way, the demand for money is the fraction of real income that the public wishes to hold as an alternative to immediate expenditures on goods and services or investment. As a central tenet of the Quantity Theory, under any given set of circumstances, the public will desire to hold some definite real quantity of money so the demand for money changes independent of changes in the supply of money. Therefore, the two are not always in equilibrium.

At times, an excess supply of money may exist in which case the public will seek to reduce excess money balances by increasing monetary expenditures. If prices and income are free to change, this increase in monetary expenditures will cause prices to rise. If price fixing by the government is customary, this increased spending will result

either in an increase in the supply of the goods and services demanded or there will be a shortage which will result in increased effective prices, later followed by an increase in the overall price level. So, the initial excess supply of money balances will be eliminated through an increase in prices or an increase in quantity demanded met by a sufficient supply of those goods and services demanded (Friedman 1968). Basically, the monetarist explanation proposes that an excess supply of money causes inflation. But, what causes a change in the demand for money in the first place?

Long run changes in the demand for money are essentially a result of changes in real income. The real interest rate, which represents the opportunity cost of holding money, is also a determinant of money demand. The Quantity Theory suggests a direct and positive relationship between the inflation rate and the rate of growth of the money supply while there is a negative relationship between the inflation rate and the rate of growth in real income. These proposed directional relationships will be tested empirically in the Miccio Model of Inflation in a later section. In addition to excess money supply as an explanation for inflation, monetarists also view excess demand of goods and services as a cause of inflation. This excess demand comes as a result of expansionary monetary and fiscal policy or when the rate of money supply growth is greater than the rate of growth of output. Excessive growth in money supply may be caused by monetization of the budget deficit which either comes in the form of the central bank printing money in making a loan to the government to repay debt or the printing of money directly by the government when the central bank is not an independent entity.

In relation to the structuralist point of view of inflation, monetarists also point out that inflation leads to distortions in the allocation of resources. In an inflationary

environment, there is a tendency to "play it safe" and allocate savings into unproductive yet secure investments that are perceived as being immune to the eroding effects of price level increases. Inflationary fears hamper economic growth as a result of the reluctance to engage in long-term investment planning. Short term investments are made, but result in disparities in the development of the industrial structure due to the lack of long-term investments.

The inflationary effects on the balance of payments also come into play. Inflation encourages imports and discourages exports because imports become relatively cheaper due to rising domestic prices. As the balance of payments worsens, expectations for devaluation of the domestic currency rise which puts further pressure on the balance of payments. In regard to the structuralist argument, monetarists view structural impediments as a direct consequence of price system distortions and an overvalued exchange rate. At times, the Latin American governments use price and exchange controls and protectionism as a means to control inflation which only worsens structural bottlenecks (Dowla 1994). Therefore, monetarists view structural impediments as a passive consequence of inflation.

Structuralists, on the other hand, recognize the financial causes as proposed by the monetarists, but emphasize economic structural inefficiencies, or bottlenecks, as the direct explanation for inflation. These problems include a deficient price system, low mobility of productive resources, and the inability for certain sectors to accommodate changes in demand.[1] The sectors that matter most in contributing to inflation include agriculture, foreign trade, and the government sectors (Dowla 1994). Increased consumer

[1] Sunkel, Osvaldo, 1958, "La Inflación Chilena: Un Enfoque Heterodoxo," *El Trimestre Económico*, v. 25, no. 4, 570-599.

demand for agricultural products comes as the result of population growth, rapid urbanization, and growth in real income. The Latin American agricultural system is dominated by either non-profit maximizing, non-capitalistic 'latifundia' or by 'minifundia' that are too small to cultivate efficiently. The sluggish supply response to increased demand results in an increase in food prices coupled with downward price inflexibility in non-agricultural sectors dominated by oligopolies. The increased food prices and downward flexibility of non-agricultural prices result in a general price level increase; this situation is termed an agricultural bottleneck (Dowla 1994).

The foreign trade bottleneck is a consequence of the discrepancy between export revenues and the demand for imports. Demand for imports is highly income-elastic in Latin America. With development efforts and economic growth, the demand for imports increases while the demand for exports may already be satisfied in which case demand for exports will not change. The excess demand for imports puts direct pressure on the government to remediate the unfavorable balance of payments. The government uses methods such as import tariffs and devaluations which adversely affect the exchange rate. This is a phenomenon known as import inflation. Baer (1967) states the chain of events nicely.[2] Import substitution, or the domestic production of former imports, has been undertaken by many Latin American countries. This strategy also results in inflation because investment must be made to create the productive capacity to produce the formerly imported goods. The investment does not result in the immediate availability of

[2] "Control of imports…will create shortages of many formerly imported goods. The relative domestic price of these goods will rise and thus contribute to the inflationary forces…balance of payments difficulties will sooner or later force countries to devalue their currencies; this will also have the effect of an immediate upward push on the price level, especially if imports consist of many consumer goods, including basic foodstuffs, which the agriculturally inelastic country might be forced to import" (p. 9).

marketable goods so that inflation occurs until the new firms are established in production (Baer 1967).

The government sector bottleneck is another contributor to inflation. Rapid development calls for greater government involvement in the economy. During rapid periods of growth and development, government expenditures often exceed government revenues. Inefficient tax systems coupled with the inability to cut expenditures results in a fiscal deficit which is oftentimes financed by inflationary means such as monetization thereby exacerbating the whole situation (Dowla 1994). In the structuralist view, inflation is inevitable in a rapidly developing country in the presence of structural bottlenecks.

Both the monetarist and the structuralist views provide valuable insights for determining the causes of inflation in Latin America. However, Dowla (1994) sheds some light in regards to the question of which model is better suited for explaining inflation. Dowla (1994) performs a non-nested hypothesis test of both models using annual data ranging from 1960-1987 across a sample of 13 Latin American countries[3] as determined by data availability. There is no specific trend in the empirical results demonstrating that neither model is solely capable of explaining inflation in Latin America. Instead, the models contribute to each other. "The conclusions point to the fact that for a sizable number of countries a joint monetarist-structuralist approach is appropriate…Future work in this area should address the need for incorporating both structural and monetarist variables within the realm of a general model of inflation" (Dowla, 1994, 271). The goal of this paper is to construct such a model providing a more efficient means for prescribing stabilization policies. Perhaps past stabilization attempts

[3] Argentina, Brazil, Colombia, Dominican Republic, El Salvador, Ecuador, Guatemala, Honduras, Panama, Paraguay, Peru, Uruguay, and Venezuela.

have failed because they have been solely based either on monetarist or structuralist models, so the Miccio Model for Inflation seeks to make an addition to the existing literature by creating a general model that incorporates a broad range of variables from both the structuralist and monetarist models.

The Miccio Model for Inflation

The dependent variable in the Miccio Model for Inflation is the GDP deflator. While existing research makes use of various price indices as variables for inflation, the GDP deflator is a more accurate way of capturing inflation as a dependent variable. Brajer (1992) investigates the sensitivity of the definition of inflation employed in two alternative inflation models developed by Harberger (1963)[4] and Hanson (1985).[5] Brajer (1992) shows some sensitivity exists in both models while the Hanson model is the better specified model of the two. Inflation models have most commonly utilized the consumer price index (CPI) or the GDP deflator to measure inflation. Some deficiencies of the CPI include the fact that only private consumption goods are included in the measurement and the scope of this measurement varies across countries (Brajer 1992). The GDP deflator measures the prices of all goods and services produced instead of private consumption goods only. In addition, the CPI is a Laspeyres index which measures prices using a fixed basket of goods and services, while the GDP deflator is a Paasche index that allows the basket of goods to change over time as the composition of GDP changes (Mankiw 32). Overall, the GDP deflator offers a more broad measurement of inflation (Brajer 1992) and will therefore serve as the dependent variable in the Miccio Model for Inflation.

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[4] Harberger, A.C., 1963, "The Dynamics of Inflation in Chile," in: C.F. Christ, ed., *Measurement in Economics: Studies in Mathematical Economics and Econometrics in Memory of Yehuda Grunfeld* (Stanford University Press, Stanford, CA) 219-250.

[5] Hanson, J.A., 1985, "Inflation and Imported Input Prices in Some Inflationary Latin American Economies," *Journal of Development Economics*, v. 18, 395-410.

Existing literature concerning the causes of Latin American inflation provides guidance in regards to which independent variables should be utilized in the model. Dowla (1994) presents an empirical test of both the monetarist model as provided by Harberger (1963) and the structuralist model. The Harberger model is based on the liquidity preference function of the demand for money which views the demand for money as a function of the price level, real income, and the cost of holding money. The Harberger equation is as follows:

$$P_t = a + bM_t + cM_{t-1} + dY_t + eP'$$

Where P_t is the inflation rate at time t; M_t is the rate of growth of the money supply at time t; M_{t-1} is a lagged effect of the money supply growth on inflation; Y_t is the rate of growth of real income at time t; and P' is a proxy for the expected cost of holding money. P' represents $P_{t-1} - P_{t-2}$ which is the change in the inflation rate between two periods relative to time t. Harberger utilizes this proxy because capital markets in Latin America are not well developed. Interest rates are usually set by the government and remain constant rendering the interest rate futile as an explanatory variable. Dowla alters the model somewhat and utilizes M1 as a measure for M_t and the rate of growth in real GDP as a measure of Y_t. He uses the Harberger method for the measurement of the cost of holding money (P').

The structuralist model attributes inflation to three structural bottlenecks: the agricultural bottleneck, the foreign trade bottleneck, and the fiscal bottleneck. The structuralist model in Dowla (1994) is as follows:

$$Pt = f + g(ABINDEX) + h(FIINDEX) + i(FORINDEX) + \varepsilon_{2t}$$

Where ABINDEX represents the rate of change in the ratio of the food price index over CPI as a proxy for the agricultural bottleneck; FIINDEX represents the deficit as a percentage of GDP as a proxy for the fiscal bottleneck; and FORINDEX represents two separate figures, changes in the terms of trade and the import to GDP ratio, as a proxy for the foreign trade bottleneck. The ε_{2t} variable represents the white-noise or random error term.

The Miccio Model for Inflation will utilize some of the variables as proposed by Dowla (1994). First, the structuralist bottleneck indices incorporated by Dowla will be included in the model using similar proxies. These variables will be included to quantitatively test the effects on inflation as proposed by structuralists. In addition, the Harberger model will be utilized to capture monetarist effects of inflation. Thus, the rate of growth in money supply as well as a lagged effect will be included. Both M1 and M2 will be quantitatively tested in order to determine which measurement of the money supply variable is more suitable. The demand for money and the rate of real GDP growth will also be included in the model.

Additional variables which may contribute to inflation will be included to extend the scope of Dowla (1994) as well as the scope of the structuralist and monetarist models. Openness is a useful variable as suggested by Romer (1993). Openness is computed as the ratio of exports plus imports over GDP. This variable will serve as the measure of the foreign trade bottleneck in Dowla (1994). The hypothesized direction of the openness variable should be negative (Romer, 1993; Lane, 1997; and Gruben and McLeod, 2004).

Romer (1993) demonstrates the reasons for the negative link between openness and inflation. Benefits of unanticipated money supply growth decrease as the degree of

openness increases. As the money supply increases, the real exchange rate depreciates resulting in a decrease in net exports. Domestic goods are relatively more expensive in times of exchange rate depreciation so imports increase while exports decrease, thus resulting in a change in the balance of payments. A balance of payments variable will be included in the model in order to determine whether the trade balance has any significant effect on inflation. Due to the uncertainty of the direction of the trade balance variable and whether a trade surplus or trade deficit exists in a reference period, no hypothesis will be made regarding direction. The actual direction will be observed upon running the regression analysis. According to Romer (1993), incentives for policy makers to implement expansionary policy are lower in more open economies because of the higher relative dependence on imports and the adverse affects of exchange rate depreciation on exports. Lane (1997) is in agreement with Romer (1993) and demonstrates that the openness effect is strengthened when country size is taken into account; the relationship is applicable to large and small economies alike. Gruben and McLeod (2004) demonstrate that the negative link becomes empirically stronger and more robust in the 1990s across all country groups. Thus, openness will be included as an explanatory variable in this model with an expected negative direction.

In a study on modern hyper- and high inflations, Fischer, Sahay, and Végh (2002) suggest that the exchange rate plays a significant role in determining inflation. Gruben and McLeod (2004) also lend significance to this explanatory variable in showing that the magnitude of the openness-inflation link increases as the exchange rate becomes more flexible. A real exchange rate variable will be included in order to study the effects of exchange rate appreciation and depreciation on inflation. There is an inverse relationship

between the exchange rate and inflation, so with an appreciation of the exchange rate, inflation goes down and vice versa. The exchange rate could affect both the balance of payments (structuralist) and the money supply (monetarist). If a country has a fixed exchange rate, the central bank manipulates the money supply only to keep the exchange rate constant. Monetary policy in this case is rendered ineffective for uses other than controlling the exchange rate. If a country has a floating exchange rate, an increase in the money supply causes a depreciation of the exchange rate which adversely affects the balance of payments because exports are relatively more expensive than imports.

In addition to the variables listed above, fiscal balance and crude oil prices will be utilized as independent variables. The standard explanation for what triggers inflation is fiscal imbalances (Fischer, Sahay, and Végh 2002). Fischer, Sahay, and Végh (2002) run numerous regressions and find that fiscal balance and inflation are inversely related.[6] Thus, a negative direction is predicted for the fiscal balance variable. The price of crude oil will also be incorporated with a hypothesized positive direction under the rationalization that as oil prices increase, a general price level increase usually follows.

The last independent variable of interest will be inflation from the previous period of reference or the GDP deflator at time t minus one. The GDP deflator lag is hypothesized to be the most empirically significant variable as this gives the government and various speculators an approximate idea of what inflation rate to expect for the upcoming year. One lag of the GDP deflator will be used, but the case may be that many GDP deflator lags are appropriate in formulating a more accurate expectation for inflation. The regression results will be analyzed and the number of necessary lags will

[6] Specifically, "a reduction in the fiscal balance by 1 percent of GDP in the high-inflation countries leads to an increase in the inflation rate by 4.2 percent" (pp.854).

be determined based on the empirical results observed. The hypothesized direction of this variable is positive; as the previous year's GDP deflator increases, inflation in the reference period is predicted to increase as well.

Data and Methods

Table 1 summarizes all of the variables utilized as well as the various model specifications employed in this study. Table 2 presents all of the computations involved in obtaining the final data points as well as the units of measure for each of the thirteen variables utilized in the final model specification. GDP, exports, imports, fiscal balance, M1, M2, interest rate in the form of the deposit rate, consumption (both private and public), and the consumer price index data were all obtained from the International Monetary Fund's (IMF) International Financial Statistics (IFS) database which provides annual, quarterly, and monthly financial data for every country. Food price data, from which the food price indices were computed, was obtained from the Food and Agricultural Organization of the United Nations (FAO). Food prices are expressed in millions of international dollars. The FAO indexes food prices using a Geary-Khamis equation[7] so that all food price values are on the same scale regardless of what country the data concerns. World crude oil price data was obtained from the US Energy Information Administration's (EIA) Department of Energy (DOE). GDP deflator and real exchange rate data was obtained from the US Department of Agriculture's (USDA) Economic Research Service (ERS).

[7] An aggregation method in which category "international prices" (reflecting relative category values) and country purchasing power parities (depicting relative country price levels) are estimated simultaneously from a system of linear equations. The method has the property of base-country invariance, matrix consistency and transitivity (OECD Glossary of Statistical Terms).

The countries analyzed in this study include Bolivia, Brazil, Colombia, Ecuador, Panama, Peru, Uruguay, and Venezuela due to limited data availability. Various years for each country were removed due to the lack of data availability for some variables in some years. Table 3 provides a summary of years analyzed for each country as well as total observations within the empirical analysis. Out of the four model specifications undertaken as shown in Table 1, the 13-variable model specification will be used for the Miccio Model for Inflation. The predicted direction and the classification of the 13 variables as monetarist, structuralist, or both are exhibited in Table 4. The 13-variable model was preferred for a few reasons.

First, after regression of the 17-variable specification, both M1 and M2 were statistically significant; however, M2 captures M1. To avoid redundancy, M2 was removed from the model and M1 was deemed a more appropriate measurement of the money supply. The empirical results from a stepwise regression are shown in Table 5 for each specification for all countries combined as well as for each individual country previous to testing and correcting for existing autocorrelation[8] and heteroskedasticity.[9] It is interesting to note that in all cases except for Ecuador in the 17-variable specification specifically, the GDP deflator lag is significant. This suggests that historical inflation rates do in fact have an effect on current inflation rates.

The next specification undertaken was the 11-variable specification. Trade balance, fiscal balance, and M1 were removed from the 14-variable specification in an attempt to sort out any redundant variables. The openness variable might capture the effects of the trade balance because the computed ratio includes a summation of exports

[8] Also known as serial correlation; correlation between the error terms in different time periods in a time series or panel data model (Wooldridge 869).
[9] Given the explanatory variables, the variance of the error term is not constant (Wooldridge 863).

and imports. The fiscal balance effect might be captured by the fiscal bottleneck ratio. Lastly, the growth of M1 might adequately capture the effects of the money supply more accurately as the growth in money supply seems to cause inflation instead of the nominal money supply value. Due to uncertainty regarding these possible effects, the 13-variable specification includes trade balance, fiscal balance, and M1. The 14-variable specification produced reasonable results; however, the interest rate variable for each country was lacking due to unavailability of data. The interest rate variable was then removed. The 13-variable model included the variables to definitely determine whether they should be sorted out or kept within the model. Overall, the three variables were included in the model.

Results

SAS was the program employed to perform the linear multiple regressions as well as all statistical tests in this study. A stepwise regression was utilized in sorting the significant explanatory variables for all countries combined as well as on an individual-country level. The Durbin Watson method was employed in testing for autocorrelation, and an autoregression program was used to remedy the existence of autocorrelation. Heteroskedasticity was corrected using the Weighted Least Squares (WLS) method. Table 6 presents the significant variables for all countries and for each individual country after testing and correcting for autocorrelation and heteroskedasticity. The table includes parameter estimates, their respective t values, and whether predictions were correct or not. The predictions were accurate around 50% of the time. This result suggests that the model requires more statistical work. Future tests to achieve greater accuracy include

tests for multicollinearity[10] and simultaneity.[11] The results do seem practical for the most part. The magnitudes of the effect on GDP deflator units seem reasonable in most cases; however, there are a few magnitudes which seem outrageous (these are represented by the gray terms in Table 6). In addition, the directions of the variables could possibly be incorrect in 50% of the cases where predictions were inaccurate. Again, these results indicate that more statistical work needs to be done in obtaining an accurate model for inflation. These inaccuracies could possibly be due to the existence of multicollinearity and simultaneity which will be tested for in the future.

Some interesting conclusions can still be drawn from the feasible results. Table 7 shows the frequency of statistical significance for each variable as well as the countries in which the variables are significant. The fiscal bottleneck and average crude oil price variables were not significant in any of the regressions. Average crude oil price should be significant due to the fact that oil price increases lead to general price level increases in most cases. In addition, openness and money supply (M1) play only minor roles in determining inflation with a frequency of one occasion of significance for both variables. What seems to be practical is the fact that the lag of M1 and money demand are the most frequently significant variables as these are pieces of the argument posed by monetarists. In addition, the agricultural bottleneck seems to play some significant role in determining inflation as maintained by structuralists. Lastly, the GDP deflator lag is significant in every single regression. This result points to the fact that expectations for inflation may be the most significant determinant of current inflation. Future work includes running

[10] A case where correlation among independent variables exists (Wooldridge 866).

[11] A case where at least one explanatory variable is determined simultaneously with the dependent variable (Wooldridge 869).

regressions with additional lags of the GDP deflator to analyze how historical rates of inflation affect the current rate of inflation.

The most useful results come from analysis of Table 8 which provides the classification of the significant variables in each estimated country model. Neither the monetarist nor the structuralist variables are the sole determinants of inflation in any case. The table demonstrates that a joint monetarist-structuralist approach would in fact be appropriate for determining inflation as suggested by Dowla (1994). This result is useful for policymakers attempting to stabilize inflation in various Latin American countries. A common focus of policy is to focus solely on monetarist or structuralist factors in attempting stabilization. It appears to be a better idea to focus on a more broad range of reforms that include both monetarist and structuralist elements for stabilization.

Conclusions

The empirical results seem to indicate that a joint monetarist-structuralist approach is appropriate in highlighting the determinants of inflation in Latin America. A more broad range of variables than presented by the monetarist and structuralist views is necessary for pinpointing the causes of inflation to guide stabilization policies as evidenced by the significance of non-monetarist and non-structuralist variables. The model in this study still needs work to serve as an accurate predictor of inflation. Each specific country has a unique economic and financial history which may include exogenous shocks that are unaccounted for in this analysis. In addition, pertinent variables for the explanation of inflation may have been omitted from the proposed Miccio Model for Inflation. Lane (1997) suggests other pertinent variables for analysis such as central bank independence (CBI), turnover of central bank governors, and

political instability. Inflation is negatively related to central bank independence (Jácome and Vázquez 2005; Cukierman, Miller, and Neyapti 2002). Jácome and Vázquez (2005) run a panel regression for 24 countries in Latin America and the Caribbean in the 1990s and confirm the negative link between inflation and CBI. They use the Cukierman (1992) index which assigns a code for a country's CBI based on 16 characteristics that involve such measures as the degree of authority over monetary policy, procedures for resolving disputes between the CB and the government, the importance of controlling the price level as a CB objective, seriousness of government lending limitations imposed on the CB, and procedures for the appointment and dismissal of the CB governor (Cukierman, Miller, and Neyapti 2002). Jácome and Vázquez (2005) and Cukierman, et al. (2002) highlight the negative relationship from inflation to CBI; however, reverse causality running from CBI to inflation has not yet been ruled out. These variables seems to be useful for predicting inflation, but data is not publicly available which presents a limitation for including all relevant variables within any given model.

Another example of a possibly pertinent variable is political instability. Barro and Wolf (1989) measure political instability as the average number of revolutions and coups per year in a country. Lane (1997) shows an empirically significant positive relationship between the number of revolution and coups per year and the rate of inflation. Thus, as political instability increases, it can be assumed that the rate of inflation will increase. In addition, greater political instability also involves more volatile inflation rates. Country risk factors might be employed as a proxy for political instability representing a more general measure of country instability; however, uniform data availability again presents a limitation to incorporation into the analysis. These are only a few examples as to what

may have been omitted from the Miccio Model for Inflation. A plethora of possible explanatory variables exists, each of which might prove to be significant for determining inflation. The problem of pinpointing each and every cause of inflation is an impossible feat and is outside the scope of this study; however an increased understanding of the causes of inflation is possible through further analysis of pertinent inflationary factors. While the Miccio Model for Inflation is incomplete as of yet, the general results are interesting and point to the fact that future endeavors should include formulation of a model for inflation that includes monetarist variables, structuralist variables, and variables that do not fall under either classification.

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TABLE 1. Model specifications and variables utilized

Linear—17 variables	**Linear—14 variables** (removed M2, growth of M2, lag of M2)	**Linear—13 variables** (removed interest rate)***	**Linear—11 variables** (removed M1, trade balance, fiscal balance; interest rate included)
-Agricultural Bottleneck -Fiscal Bottleneck -Openness (Foreign Trade Bottleneck) -M1 (Money Supply) -Growth of M1 -M2 (Money Supply) -Growth of M2 -Lag of M1 -Lag of M2 -Growth in GDP -Money Demand -Exchange Rate -Trade Balance -Fiscal Balance -Interest Rate -Crude Oil Price -GDP Deflator $_{t-1}$	-Agricultural Bottleneck -Fiscal Bottleneck -Openness (Foreign Trade Bottleneck) -M1 (Money Supply) -Growth of M1 -Lag of M1 -Growth in GDP -Money Demand -Exchange Rate -Trade Balance -Fiscal Balance -Interest Rate -Crude Oil Price -GDP Deflator $_{t-1}$	-Agricultural Bottleneck -Fiscal Bottleneck -Openness (Foreign Trade Bottleneck) -M1 (Money Supply) -Growth of M1 -Lag of M1 -Growth in GDP -Money Demand -Exchange Rate -Trade Balance -Fiscal Balance -Crude Oil Price -GDP Deflator $_{t-1}$	-Agricultural Bottleneck -Fiscal Bottleneck -Openness (Foreign Trade Bottleneck) -Growth of M1 -Lag of M1 -Growth in GDP -Money Demand -Exchange Rate -Interest Rate -Crude Oil Price -GDP Deflator $_{t-1}$

***Represents the specification utilized.

TABLE 2. Computations and units of measure by variable

Designation	Variable	Computation	Unit of Measure
Y	GDP deflator	--	Index; 2000=100
X1	Agricultural Bottleneck	$= \frac{\text{Food Price Index}}{\text{CPI}}$	Index; 2005=100
X2	Fiscal Bottleneck	$= \frac{\text{Fiscal Balance}}{\text{GDP}} \times 100$	Percent
X3	Openness (Foreign Trade Bottleneck)	$= \frac{\text{Exports + Imports}}{\text{GDP}}$	Units
X4	M1 (Money Supply)	--	Millions of national currency
X5	Growth in M1	$= \frac{M1 - M1_{t-1}}{M1_{t-1}}$	Percent
X6	Lag of M1 ($M1_{t-1}$)	--	Millions of national currency
X7	Growth in GDP	$= \frac{GDP - GDP_{t-1}}{GDP_{t-1}}$	Percent
X8	Money Demand	--	Millions of national currency
X9	Real Exchange Rate	Calculated from nominal exchange rate and CPI	2000=100 units
X10	Trade Balance	= Exports – Imports	Millions of national currency
X11	Fiscal Balance	= Gov't Revenue – Gov't Expenditures	Millions of national currency
X12	Crude Oil Price	Average of all crude oil types in a given year[1]	Nominal $US per barrel
X13	Previous GDP Deflator ($GDP\ Deflator_{t-1}$)	--	Index; 2000=100

[1]Types of crude oil: Saudi Arabian, Iranian, Libyan, Nigerian, Indonesian, Venezuelan, Mexican, UK

TABLE 3. Observations

Country	Analytical Period (based on data availability)	Total Years Analyzed	Total Variables Analyzed	Total Observations Analyzed
Bolivia	1978-1988; 1993-2005	24	13	312
Brazil	1980-2005	26	13	338
Colombia	1971-2005	35	13	455
Ecuador	1971-2004	34	13	442
Panama	1971-1985; 1988-2005	33	13	429
Peru	1971-2005	35	13	455
Uruguay	1972-2005	34	13	442
Venezuela	1971-2004	34	13	442
		Total Observations in Study:		3315

TABLE 4. Predicted direction and variable classification

Variable	Predicted Direction	Classification
Agricultural Bottleneck	Positive	Structuralist
Fiscal Bottleneck	Positive	Structuralist
Openness (Foreign Trade Bottleneck)	Negative	Structuralist
M1 (Money Supply)	Positive	Monetarist
Growth in M1	Positive	Monetarist
Lag of M1 ($M1_{t-1}$)	Positive	Monetarist
Growth in GDP	Negative	Both
Money Demand	--	Monetarist
Real Exchange Rate	Negative	Both
Trade Balance	--	Both (more structuralist)
Fiscal Balance	Negative	Both (more structuralist)
Crude Oil Price	Positive	Both
Previous GDP Deflator ($GDP\ Deflator_{t-1}$)	Positive	Both

TABLE 5. Stepwise Results preceding tests and corrections for autocorrelation and heteroskedasticity

Country	17-Variable Specification[1]	14-Variable Specification	13-Variable Specification***	11-Variable Specification
All Countries	OldGDPdefl ExchRt M1 GrowthM1 GrowthM2	OldGDPdefl ExchRt M1 GrowthM1	OldGDPdefl ExchRt GrowthM1	OldGDPdefl ExchRt MoneyD GrowthM1
Bolivia	OldGDPdefl ExchRt AgrBot	OldGDPdefl ExchRt AgrBot	OldGDPdefl ExchRt TrdBal AgrBot	OldGDPdefl ExchRt AgrBot
Brazil	M2 TrdBal LagM2 FiscBal ExchRt	OldGDPdefl MoneyD FiscBal	OldGDPdefl MoneyD FiscBal	OldGDPdefl MoneyD LagM1 Open
Colombia	OldGDPdefl AgrBot ExchRt	OldGDPdefl AgrBot ExchRt	OldGDPdefl LagM1 MoneyD TrdBal Open AgrBot	OldGDPdefl AgrBot ExchRt
Ecuador	M2 LagM1 GrowthM1 LagM2 TrdBal	OldGDPdefl GrowthGDP TrdBal GrowthM1	OldGDPdefl GrowthGDP TrdBal AgrBot MoneyD LagM1 Open	OldGDPdefl GrowthGDP AgrBot MoneyD Open CrudeP
Panama	OldGDPdefl ExchRt	OldGDPdefl ExchRt	OldGDPdefl GrowthGDP GrowthM1 AgrBot LagM1	OldGDPdefl ExchRt
Peru	OldGDPdefl FiscBot FiscBal AgrBot IntRt GrowthM2 Open	OldGDPdefl FiscBot FiscBal AgrBot IntRt GrowthM1 TrdBal GrowthGDP	OldGDPdefl ExchRt GrowthGDP FiscBal GrowthM1 LagM1 TrdBal	OldGDPdefl FiscBot AgrBot IntRt GrowthM1 Open
Uruguay	OldGDPdefl LagM1 M2 MoneyD M1 LagM2	OldGDPdefl LagM1 Open AgrBot CrudeP	OldGDPdefl LagM1 TrdBal M1 MoneyD	OldGDPdefl LagM1 Open AgrBot CrudeP
Venezuela	OldGDPdefl MoneyD LagM2 M2 FiscBal IntRt	OldGDPdefl MoneyD GrowthM1 FiscBal LagM1	OldGDPdefl MoneyD GrowthM1 FiscBal LagM1	OldGDPdefl MoneyD GrowthM1

[1]Initial stepwise regression results before testing and correcting for autocorrelation and heteroskedasticity.
***Represents the specification utilized.

TABLE 6. Empirical Results

Country	Significant Variables*	Parameter Estimate**	t Value	Predicted Direction	Actual Direction	Was Prediction Accurate?
All Countries	OldGDPdefl	1.0477	64.86	+	+	Y
Bolivia	AgrBot	- 0.003403	- 2.61	+	--	N
	ExchRt	8.6516	4.42	--	+	N
	TrdBal	- 0.001224	- 2.38	n/a	--	n/a
	OldGDPdefl	0.6962	9.80	+	+	Y
Brazil	MoneyD	0.001128	9.38	n/a	+	n/a
	FiscBal	- 0.001140	- 9.36	--	--	Y
	OldGDPdefl	0.4160	5.09	+	+	Y
Colombia	Open	26.8386	2.45	--	+	N
	LagM1	- 3.036E-6	- 4.21	+	--	N
	MoneyD	2.1651E-6	3.33	n/a	+	n/a
	TrdBal	- 7.653E-7	- 5.14	n/a	--	n/a
	OldGDPdefl	1.1434	30.74	+	+	Y
Ecuador	AgrBot	- 1.6790	- 3.46	+	--	N
	LagM1	- 0.0144	- 3.23	+	--	N
	GrowthGDP	0.4694	6.22	--	+	N
	MoneyD	0.0168	3.89	n/a	+	n/a
	TrdBal	- 0.004597	-3.88	n/a	--	n/a
	OldGDPdefl	0.8933	14.46	+	+	Y
Panama	AgrBot	- 1625	- 2.87	+	--	N
	GrowthM1	- 0.0703	- 1.86	+	--	N
	LagM1	0.005913	2.05	+	+	Y
	GrowthGDP	0.2459	3.19	--	+	N
	OldGDPdefl	0.7808	8.93	+	+	Y
Peru	GrowthM1	0.002800	4.35	+	+	Y
	LagM1	- 0.000467	- 4.25	+	--	N
	GrowthGDP	- 0.007349	8.30	--	--	Y
	ExchRt	6.2650	24.36	--	+	N
	TrdBal	0.000141	2.39	n/a	+	n/a
	FiscBal	0.000484	2.49	--	+	N
	OldGDPdefl	0.9307	41.99	+	+	Y
Uruguay	M1	0.006146	7.42	+	+	Y
	LagM1	- 0.004369	- 5.33	+	--	N
	MoneyD	- 0.006514	- 7.01	n/a	--	n/a
	OldGDPdefl	1.7313	17.16	+	+	Y
Venezuela	GrowthM1	0.0285	3.64	+	+	Y
	LagM1	- 0.003672	- 6.68	+	--	N
	MoneyD	0.001897	6.97	n/a	+	n/a
	FiscBal	0.003682	6.52	--	+	N
	OldGDPdefl	1.4845	22.95	+	+	Y
			Accurate predictions: 15/31=48.4% **Inaccurate predictions:** 16/31=51.6%			

*Using the WLS method of correcting for heteroskedasticity yielded an applicable weight equal to the inverse of the square root of X_i where i=the ith X term, or in the formulaic form of $1/SQRT(X_i)$.
**In addition to the parameters listed, there were instances of statistically significant autoregressive terms.

TABLE 7. Frequency of statistical significance

Variable	Frequency of Statistical Significance	Specific Countries in which variable is significant
Agricultural Bottleneck	3/8	Bolivia, Ecuador, Panama
Fiscal Bottleneck	0/8	None
Openness (Foreign Trade Bottleneck)	1/8	Colombia
M1 (Money Supply)	1/8	Uruguay
Growth in M1	3/8	Panama, Peru, Venezuela
Lag of M1 ($M1_{t-1}$)	6/8	Colombia, Ecuador, Panama, Peru, Uruguay, Venezuela
Growth in GDP	3/8	Ecuador, Panama, Peru
Money Demand	5/8	Brazil, Colombia, Ecuador, Uruguay, Venezuela
Real Exchange Rate	2/8	Bolivia, Peru
Trade Balance	4/8	Bolivia, Colombia, Ecuador, Peru
Fiscal Balance	3/8	Brazil, Peru, Venezuela
Crude Oil Price	0/8	None
Previous GDP Deflator (GDP $Deflator_{t-1}$)	Within all countries; across all countries	All

TABLE 8. Determinants of inflation by country and classifications of model

Country	Significant Variables	Classification
All Countries	OldGDPdefl	Both
Bolivia	AgrBot	Structuralist
	ExchRt	Both
	TrdBal	Both (more structuralist)
	OldGDPdefl	Both
Brazil	MoneyD	Monetarist
	FiscBal	Both (more structuralist)
	OldGDPdefl	Both
Colombia	Open	Structuralist
	LagM1	Monetarist
	MoneyD	Monetarist
	TrdBal	Both (more structuralist)
	OldGDPdefl	Both
Ecuador	AgrBot	Structuralist
	LagM1	Monetarist
	GrowthGDP	Both
	MoneyD	Monetarist
	TrdBal	Both (more structuralist)
	OldGDPdefl	Both
Panama	AgrBot	Structuralist
	GrowthM1	Monetarist
	LagM1	Monetarist
	GrowthGDP	Both
	OldGDPdefl	Both
Peru	GrowthM1	Monetarist
	LagM1	Monetarist
	GrowthGDP	Both
	ExchRt	Both
	TrdBal	Both (more structuralist)
	FiscBal	Both (more structuralist)
	OldGDPdefl	Both
Uruguay	M1	Monetarist
	LagM1	Monetarist
	MoneyD	Monetarist
	OldGDPdefl	Both
Venezuela	GrowthM1	Monetarist
	LagM1	Monetarist
	MoneyD	Monetarist
	FiscBal	Both (more structuralist)
	OldGDPdefl	Both